

# Enhanced Memory for Intentional Moral Actions

Author: Lauren Nicole Anderson

Persistent link: <http://hdl.handle.net/2345/3851>

This work is posted on [eScholarship@BC](#),  
Boston College University Libraries.

---

Boston College Electronic Thesis or Dissertation, 2014

Copyright is held by the author, with all rights reserved, unless otherwise noted.

## **Enhanced Memory for Intentional Moral Actions**

BY: LAUREN ANDERSON

BOSTON COLLEGE PSYCHOLOGY DEPARTMENT

ADVISORS: JAMES DUNGAN AND LIANE YOUNG, PHD



A SENIOR HONORS THESIS SUBMITTED IN FULFILLMENT OF THE ARTS AND SCIENCES  
HONORS PROGRAM

MAY 1, 2014

### **Abstract**

Memory is dependent on a variety of factors from individual differences in storage capacity to cultural differences in attentional biases. While previous research has studied the effect of the intentionality of actions on memory, few have looked into how the intersection of intentionality and morality might affect memory. This study sought to examine how morality and intentionality affect participants' ability to remember specific information about an event. Participants read six stories from a single condition in a 2 (moral/neutral) x 2 (intentional/accidental) between-subjects design. After half an hour of non-verbal distractor tasks, participants were asked to freely recall as much information as they could from the previous stories. Although we found few significant results, we did find consistent trends suggesting that moral intentional scenarios improve participants' recall of overall memory about the event. Specifically, morality and intentionality show trends toward improving participants' memory for information about the story's agent, their action, and whether or not their action was done intentionally or accidentally. The lack of significance could stem from a small sample size for each condition (N=20), which did not give enough power for statistical analyses. We discuss this and other limitations, as well as future directions on how these preliminary results apply to cultural and linguistic differences in memory and how this could have important implications for eyewitness testimony.

## Introduction

What we remember about people and their actions can have a profound effect on our day-to-day life. Our judgments of the people around us rely heavily on our memory for their past actions and the effects these actions have on us. The majority of actions that we witness every day lack any moral implications, but occasionally we see, hear, or read about morally charged actions. These morally charged actions grab our attention and stick with us for days or weeks after the event, but what is it exactly about these events that are retained in our memory? Is it the person who performed the action or the consequences that follow the action that become our focus? Understanding which facets of an event are prioritized in our memory could reveal what aspects of morality are especially important to us.

In the present study we will examine whether the circumstances surrounding an event, such as whether it is a morally charged scenario or morally neutral scenario, will affect what is remembered about the event. Since actions are so tightly tied to who performed the actions, we will also look at whether the intentionality of an agent performing the action affects how people might remember the event. We will also be looking at whether these different scenarios affect what details of an event are salient and are more likely to be remembered, such as details about an agent or the action itself.

Morality has been theorized to have a dyadic structure, which includes an agent intentionally performing an action that is perceived to be harmful to a suffering patient (Gray et al., 2012). Judging an act to be moral, immoral, or neutral requires the capacity to determine a behavior is intentional (Decety, 2012). The intentionality of the agent and the perceived harm resulting from the act are integral to people's judgments of whether the act

is immoral or not. While perceived harm is a fairly straightforward concept with the perceiver deeming whether harm occurred or not, intentionality has been shown to be a more complex concept.

Intentionality has been extensively researched and has been found to be one of the most important facets when establishing blameworthiness of an action. Children as young as three years old will attribute more responsibility to an agent for an intentional action compared to an accidental action (Nunez & Harris, 1998). Intentionality is also a stable, well-known concept, with most adults defining intentionality in similar ways (Malle & Knobe, 1997). Malle and Knobe found that there are five necessary elements to determining the intentionality of an action. These elements are the desire for an outcome, the belief that the action will lead to that outcome, the intention to perform that act, the awareness of performing that act, and the skill to perform that act so that the desired outcome occurs. They found that if any of these elements are absent then the presumed intentionality of an action drops significantly. The example they used was of Jerry who was a novice at playing darts and was not usually good at games like darts. On his first try he hit a triple 20, which his friend dismissed as a fluke. We can say that Jerry had the desire to hit this impressive score, had the intent to hit this score, and had the awareness that he was performing the act of throwing the dart that could lead to this score, but he lacked the skill to actually hit this, so most people would say that Jerry did not intentionally hit a triple 20. However, when told that Jerry hit a triple 20 again, people were much more likely to regard Jerry as intentionally hitting the triple 20. Hitting this score twice in a row demonstrates some sort of skill and, therefore, the intentionality judgments increased.

However, there is also evidence to suggest that intentionality is automatically inferred from actions and that it takes cognitive effort to override this intentionality bias (Rosset, 2008). When presented with actions that are normally done on accident, but could be done on purpose (i.e. "He hit a man with his car") participants were more likely to determine that these actions were done intentionally under a speeded condition. Additionally, when presented with actions that are always considered to be done accidentally, (i.e. "He poked himself in the eye") there were some participants in the speeded condition who deemed these actions to be intentional. This indicates that when put under time pressure people cannot inhibit their automatic inference of intentionality as well as when they are given a longer amount of time to respond. Rosset also found that the effortful process of overriding the intentionality bias leads people to remember accidental actions better. Participants read sentences about both intentional actions and accidental actions. The experimental group was asked to decide whether the action was done intentionally or unintentionally and the control group was asked to decide whether the action was pleasant or unpleasant. When asked to recall as many sentences as they could after a brief distraction period, the group who had to make intentionality judgments remembered more unintentional actions than intentional. However, people in the control group remembered more intentional actions than accidental. This indicates that the effort required to override the intentionality bias helped to encode this information for later recall.

In Rosset's (2008) study the participants were only asked to recall the sentence and these responses were coded as either full or partial sentences. The gender of the pronoun or the agent could be changed and still considered to be a full sentence as long as the verb

and object were correct. However, another important facet of determining responsibility or blameworthiness of an action has to do with the agent doing the action. In contrast to these findings, Camilleri (2010) found that when participants were presented with videos of different colored triangles that were either helpers or hinderers and were acting either intentionally or unintentionally, participants remembered the color of the triangles (agents) better in the intentional condition than the unintentional condition. While this is an interesting finding, it is unclear whether these results can be generalized to remembering agent information given that participants were asked to remember colored triangles, not human characteristics. These studies are important for understanding the cognitive processes underlying moral judgments, such as how intentionality, agent information, and actions are encoded and combined in memory.

This encoding process has been found to be a resource demanding process, especially when agent and action information is bound together (Wood, 2008). Wood found that the visual system consists of separate systems for retaining action information and agent information and the capacity for remembering these types of information are separate (Wood, 2007). To test how much information could be stored in each of these systems, participants were presented with computer-generated figures wearing different colored shirts performing everyday actions such as raising a knee. The participants were randomly assigned to one of four conditions. In the first condition, they were asked to remember only the action, in the second condition they were asked to remember only the agent, in the third condition they were asked to remember either the agent or the action, and in the fourth condition they were asked to remember the agent and the action together. It was found that participants' memory capacity for the actions-only condition was

significantly worse than the agents-only condition, but the memory for agents and actions in the agents or actions conditions was the same, indicating that memory for agents does not interfere with memory for actions and vice versa. Finally, memory capacity was significantly lower in the binding condition. The either condition showed that it is possible to retain information about multiple agents and actions simultaneously, but the poor memory capacity for the binding condition indicates that these types of information are not maintained together (Wood, 2008).

These results indicate that there is a trade-off between the amount of information maintained and whether the information is bound together, showing that the binding process is resource demanding. The actions that were tested in this study were neutral and had no moral consequences, but it is unclear whether binding agents and actions would be better for events that have moral consequences. It seems that it would be more important to remember the action and the agent together when trying to remember a moral event. However, this research indicates that if agent and action information is bound together, other information about the event could be lost because of the resource-demanding nature of the binding process. It is also possible that this information binding process is different for everyday actions that lack consequences (as were tested in Wood's 2008 study) and moral actions where the agent and their intent are extremely relevant for consequences, blame, and responsibility. This distinction could mean that people are better at binding agents and actions for moral events in comparison to events that lack any moral salience. Imagine someone is a witness to a man stealing a woman's purse. Perhaps the witness can easily remember that the man was about six feet tall and wearing a blue shirt and that he knocked the woman down as he wrestled the purse from her. The witness's attentional bias



would be towards the action and the event so they might have a more difficult time remembering the exact cross streets where the event occurred, what the weather was at the time, or in which direction the agent ran.

This example is clearly a more complicated event than a computer-generated figure lifting their leg, so the encoding process could be different for short, simple actions and longer, more complex actions. It is these complex actions that actually occur in the world around us. Complex actions, morally charged or morally neutral, occur in a specific context, have causes and consequences, and are performed by a certain person acting unintentionally or intentionally who has their own set of characteristics. Because actions typically have a variety of facets, we decided to look at whether more complicated actions would have an effect on what people remember. It is possible that people are better at remembering more complex actions because they do it every day. It is common for people to remember actions in a real world context, but it is probably less common for people to remember a series of simple actions that have no cause or consequence. However, with more complex actions there is more to be remembered. In Wood's study there were only two pieces of information that had to be remembered, but for real world actions, there are so many facets that some information may be prioritized over other information. By testing people's memory for multiple types of information, we can try to reveal what information is prioritized.

Much of the research previously conducted on intentionality involved either non-human agents or agents performing simple, everyday actions. We seek to investigate how adding the variable of morality could also play a role in memory. Specifically, we aim to investigate how morality and intentionality affect participants' ability to remember specific

information about an event. By testing memory for multiple informational categories of a story, we can begin to extract what information is more readily encoded in memory and is, therefore, more important to morality. We hypothesize that agent information will be prioritized in memory when presented with actions that have moral implications, due to the importance of agency in morality. If this is the case, we expect that other information might not be encoded in memory because of the resource demanding nature of binding agent and action information. By comparing moral and neutral conditions, we can begin to ascertain whether some information, such as intention, is always important for memory, or if morally charged actions make this information more salient.

## **Methods**

### *Participants*

Ninety-one participants (mean age=19.8, SD=1.76), sixteen male and seventy-five female, took part in an hour-long study. The participants were recruited from Boston College by means of posted fliers looking for participants to partake in current psychological studies in exchange for monetary compensation. Participants were also recruited from Boston College SONA, which gives students the opportunity to participate in studies either for money or for credit towards introductory psychology courses.

### *Procedure*

The study consisted of three different stages. The first stage was the encoding stage where participants read and familiarized themselves with six stories. This stage lasted for ten minutes. The second stage was the delay stage where the experimenter administered a series of non-verbal distractor tasks. This stage was timed to last for thirty minutes. The

final stage was the recall stage, in which participants were asked to freely recall as accurately as possible what they remembered from the previous six stories. This stage lasted as long as the participant needed.

The study was conducted as a 2 (moral/neutral) x 2 (intentional/accidental) between-subjects design, such that each participant was randomly assigned to one version of the stories (e.g. moral-intentional). Participants were presented with the six stories by means of a survey on Qualtrics Survey Software. The moral, intentional version of the story involved an agent purposefully doing an action that had moral implications (e.g. Sally walks up and unplugs his feeding tube, taking the man off of life support.). The moral, accidental version involved an agent accidentally performing an action that had moral implications (e.g. Ben pulls into the lot and does not see her standing in the middle of the road. He accidentally hits her, knocking her to the ground.). The neutral, intentional version involved an agent purposefully doing an action that had no moral implications (e.g. She pulls the lever causing the hatch to open and some food to fall into the cage. The snake eats the food, which then gets slowly digested.) The neutral, accidental version involved an agent accidentally performing an action that had no moral implications (e.g. As Chris is sewing the button, he slips and pokes his roommate's chest with his forefinger; for full versions of the stories, see Appendix A).

After reading these stories during the encoding phase, participants moved on to the delay phase in which the participants completed three different non-verbal tasks. We chose to use non-verbal tasks so that the participant would not be able to mentally rehearse the stories in their minds, which would have aided in recalling the stories in the next step.

Additionally, we did not want extra verbal information to distract from the original stories

and hinder their memory for the stories. The first distractor task that the experimenter administered was a digit span test from the third edition of the Wechsler Adult Intelligence and Memory Scale (WAIS-III) in which the experimenter read out loud a series of digits at the rate of one digit per second without voice fluctuations of any kind. The participant then repeated the numbers back to the experimenter exactly how they heard them. There were eight items with two trials per item. The first item contained two digit sequences, the second item contained three digit sequences, the third item contained four digit sequences, and so on up to nine digit sequences. The experimenter recorded the responses. If a participant failed on both trials of the item, the test was over. The experimenter then conducted the backwards digit span task with the same set up as the previous task except that the participant had to repeat the numbers back to the experimenter in the reverse order from what the experimenter read. For example, if the experimenter read the digits "7-1-9", the participant should have repeated back, "9-1-7". The experimenter recorded the responses. If the participant failed on both trials of the item, the test was over.

The experimenter then administered the Self-Ordered Pointing Task (SOPT; Petrides & Milner, 1982). In this task, there were twelve test sheets each with a grid of twelve squares each containing a unique pattern. Each sheet had a random ordering of the twelve patterned squares, however the patterns themselves remained constant throughout the test. The participants were instructed to touch all of the squares, one at a time and in any order that they wished without touching any patterned square more than once throughout the test. Once a square had been touched on a sheet, the participants were instructed to flip that sheet over and move onto the next one. The experimenter recorded

their responses. The digit span task and SOPT were both used as distractor tasks because they seek to measure components of working memory capacity.

The experimenter then gave the participant the third distractor task. This task consisted of six to twelve Sudoku puzzles. The puzzles were 9x9 grids in which the participant had to fill in the grid so that each column, row, and 3x3 square within the grid contained a single digit from 1 to 9 without repeating any numbers. When the half hour expired, the experimenter entered the room and told the participant they could stop working on the Sudoku puzzle and instructed them to continue onto the final step on the computer. When the participant moved onto the next page of the survey they were asked to try to remember the stories that they read earlier and rewrite the stories that they read as accurately as possible.

#### *Data Analysis*

Both the forward and backward digit span tasks are working memory measures of the WAIS-III, but each measures a slightly different part of the working memory. The forward digit span task mainly measures attention and short-term auditory memory while the backward digit span task primarily measures verbal working memory and the ability to manipulate verbal information while in temporary storage (Conklin, et. al., 2000; [www.nlsinfo.org](http://www.nlsinfo.org)). The SOPT is a measure of working memory that requires executive and visuospatial processing with an emphasis on strategic responding and organization<sup>1</sup> (Petrides, 1982; Ross, et. al., 2007).

---

<sup>1</sup> The digit span task and SOPT were excluded from analysis because they measure working memory, which was not related to the questions being investigated in this study.

The digit span task score has three elements, the forward score, the backward score, and the total score. The number of correct responses for the forward section is added up as well as the number of correct responses for the backward section. These sums are then added together for the total score.

The SOPT has two different scores, one is the span score and the other is the error score. The span score is the number of grids the participant goes through before making an error (repeating a pattern). The error score is the number of errors or repeats the participant makes throughout the test.

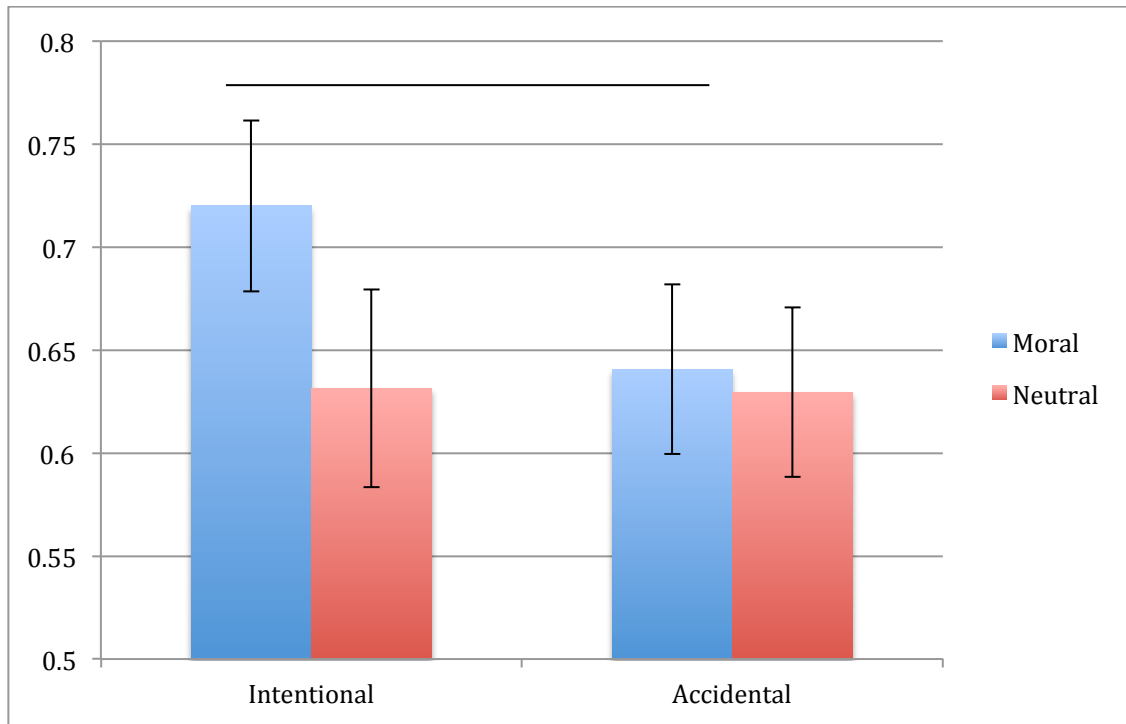
The experimenter coded the participants' responses as proportions of the total amount of information that could be remembered from any given story. The stories were broken down into six information categories (agent name, agent details, context details, action, intent, and consequence). The experimenter determined how many total pieces of information could be remembered in each category for each story. For the agent name, intent, and consequence categories there was only one piece of information that could be recalled (i.e. the participant either remembered the agent's name correctly or incorrectly). For these categories the participant received either a one for a correct response or a zero for an incorrect response. The agent details, context details, and action categories had differing amounts of information that could be recalled for each story. The amount of agent details ranged from one to three, the amount of context details ranged from six to eight, and the amount of action information ranged from one to three. While the amount of information varied across stories, each story had the same amount of information across conditions. These categories were coded as a proportion of the total amount of information that could be recalled, as was previously determined by the experimenter.

## Results

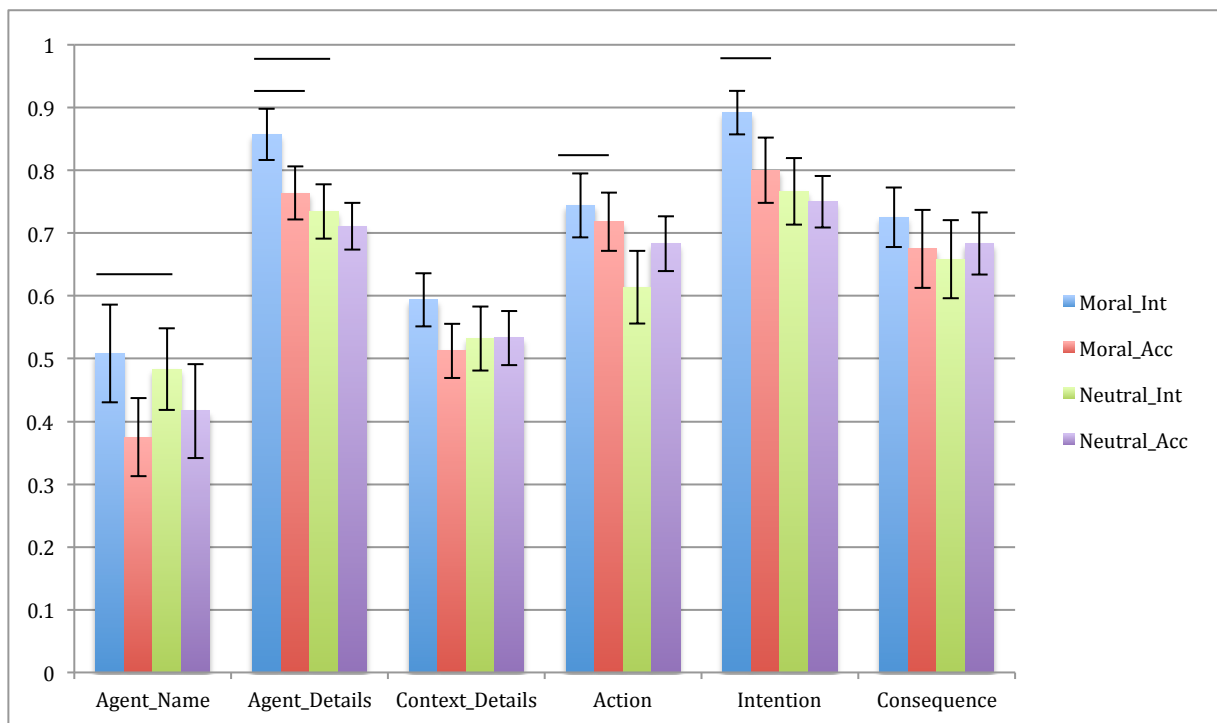
Out of the ninety-one participants who took part in this study, eleven were excluded from analysis for failure to follow instructions, which reduced the amount of time they spent on the encoding phase of the study. We were then left with twenty participants for each of the four conditions. Across all conditions and stories a total of fifty-nine stories out of 480 total presented stories were not remembered at all.

We first collapsed all information across the six categories and ran a 2 (moral/neutral) x 2 (intentional/accidental) ANOVA on the overall proportion of information recalled. There was a trending main effect of morality for intentional cases  $F(1,76)=1.298, p=.258$  and an interaction between morality and intentionality  $F(1,76)=.806, p=.372$  (see Figure 1). An independent samples t-test was conducted to compare the overall recall between the moral-intentional and moral-accidental conditions. There was a difference between moral-intentional cases ( $M=.7084, SD=.183$ ) and moral-accidental cases ( $M=.6303, SD=.184$ ) that was trending towards significance  $t(38)=1.348, p=.186$ . It appears that intentionality in moral cases is enhancing participants' overall memory for the stories and that there is little difference in overall recall across the other three conditions.

Next, we ran a multivariate ANOVA on each of the six information categories. We found a trending main effect of morality for agent details  $F(1,76)=3.959, p=.050$ , action  $F(1,76)=2.719, p=.103$ , and intention  $F(1,76)=3.626, p=0.061$ . This indicates that moral scenarios enhance participants' memory for agent details, actions, and intention. We also found a trending main effect of intentionality for agent name  $F(1,76)=2.015, p=.160$  and



**Figure 1:** ANOVA trending main effect of morality for intentional cases.



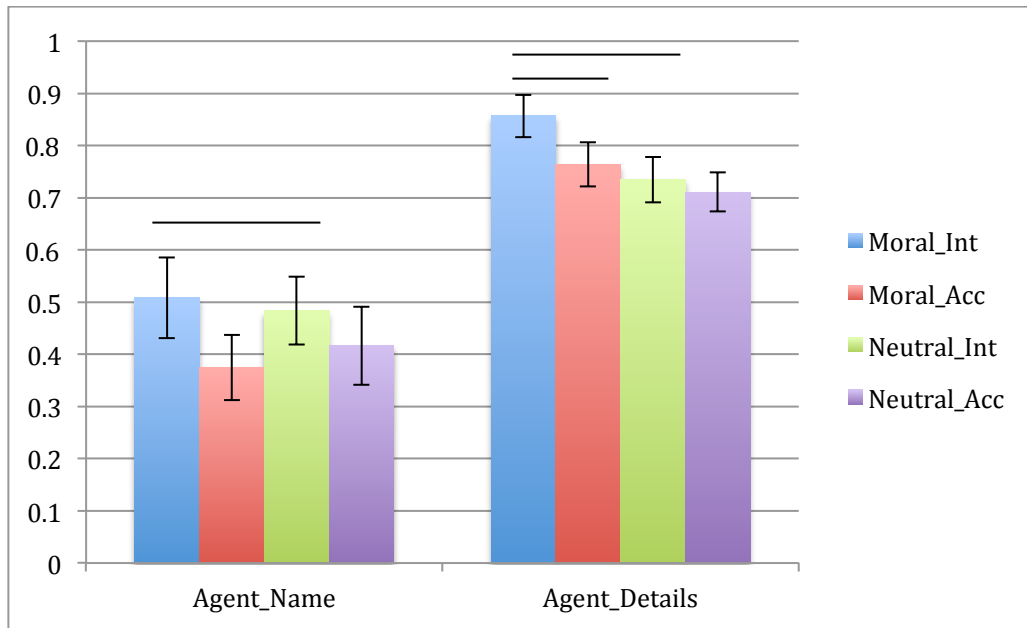
**Figure 2:** ANOVA trending main effect of morality for agent details, action, and intention. Trending main effect of intentionality for agent name and agent details.



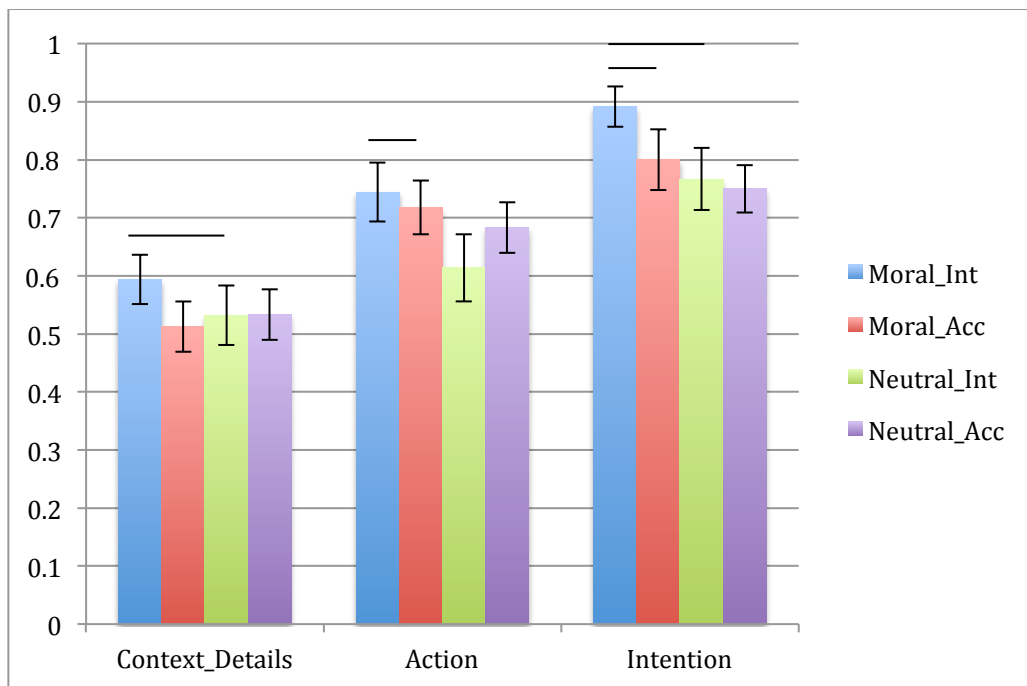
agent details  $F(1,76)=1.874$ ,  $p=.175$  (see Figure 2). It also appears that intentional scenarios enhance participants' memory for an agent's name and details about the agent.

The independent-samples t-test of agent details found that both intentional over accidental,  $t(38)=1.570$ ,  $p=.125$  and moral over neutral,  $t(38)=1.986$ ,  $p=.054$ ) were trending towards driving this effect, meaning participants in the moral intentional condition remembered agent details better than any of the other three conditions (see Figure 3). When conducting an independent-samples t-test for agent name, we found that intentional over accidental  $t(38)=1.334$ ,  $p=.190$  was trending towards driving this effect, so participants who received an intentional condition, regardless of whether it was a moral or neutral condition, remembered the agent's name better than participants who received an accidental condition (see Figure 3). When all neutral cases are excluded, intentionality also had a trending effect for context details  $t(38)=1.343$ ,  $p=.187$  and intention  $t(38)=1.462$ ,  $p=.152$  (see Figure 4). This indicates that intentional scenarios enhance participants' memory for context details and the agent's intent when completing the action.

Additionally, when all neutral cases were excluded from analysis, morality had an effect trending towards significant for intention  $t(38)=1.965$ ,  $p=.057$  and action  $t(38)=1.689$ ,  $p=.099$  (see Figure 4). It appears that moral conditions lead a participant to remember an agent's action and their intention better than in neutral conditions. On conducting independent-samples t-tests that filtered out all moral cases, we found that intentionality had no effect on any of the six categories. Intentionality then only has an effect for the moral conditions, not the neutral conditions. For participants who received either of the neutral conditions, their memory for intentional or accidental scenarios did not have differences trending towards significant at all. Similarly, when we filtered out all



**Figure 3:** Independent samples t-test shows trending effect of morality and intentionality for agent details and a trending effect of intentionality for agent name.

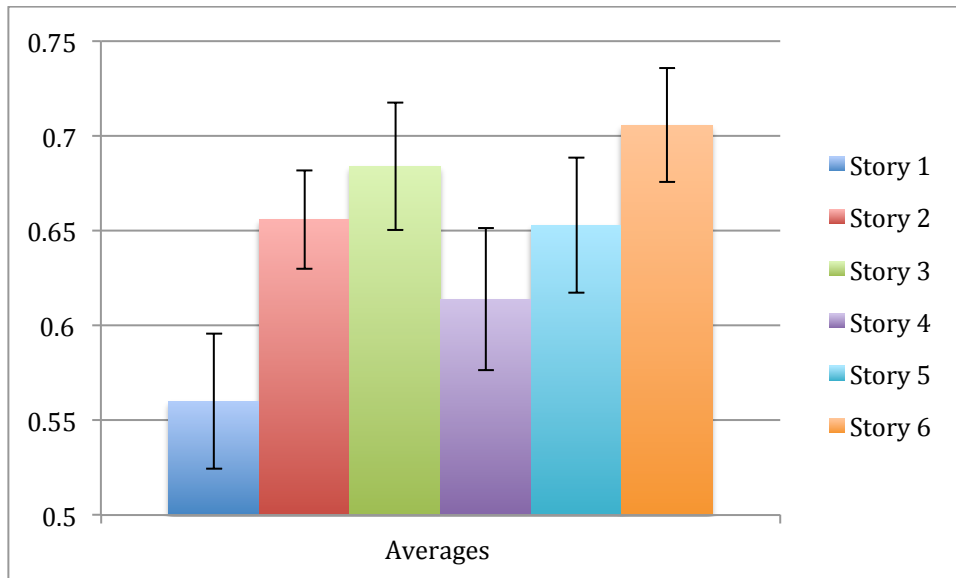


**Figure 4:** Independent samples t-test shows trending effect of intentionality for context details and intention and a trending effect of morality for action and intention.

accidental cases, morality did not have an effect on participants' ability to recall information across any of the categories.

Due to the lack of significant results, we decided to run a 6 (story) x 2 (moral/neutral) x 2 (intentional/accidental) repeated measures ANOVA with story as the within-subjects factor and the average proportion of information remembered as the between-subjects factor, to investigate if the null results stemmed from differences across stories. We observed a main effect of story  $F(5,380)=3.464$ ,  $p=.004$ , indicating that participants' recall ability differed across stories, regardless of condition. Looking at average recall across conditions for each story, we found that Story 1 was remembered the least ( $M=.5601$ ,  $SD=.319$ ) and Story 6 was remembered the most ( $M=.7058$ ,  $SD=.269$ ) (see Figure 5 and Appendix for full stories). It is unclear exactly what is driving this effect. Because the stories were presented in a randomized order there could have been recency effects of some kind with participants remembering the first story that was presented better than the subsequent stories. It is also possible that the information in the sixth story was somehow more salient than the information in the first story.

We then conducted another repeated measures ANOVA as a 6 (story) x 6 (category) x 2 (moral/neutral) x 2 (intentional/accidental) design. Critically, we found a significant interaction between category, story, and morality  $F(25,1900)=1.787$ ,  $p=.010$ . This indicates that the impact of our moral versus neutral manipulation on memory for information categories differed across the stories.



**Figure 5:** When proportions are averaged across categories, Story 6 was the most remembered story, while Story 1 was the least.

The final analysis we conducted was looking at correlations of categories by condition. Across all conditions the only category that was not correlated with all other categories was agent name (all  $p$  values  $< .05$ ). The significant correlations between all other categories indicates that if someone remembers information in one category of a story, they are more likely to remember details about other parts of the story. Categories that were correlated with agent name did differ across conditions. In the moral intentional condition, agent name was significantly correlated with all categories except for intention (all  $p$  values  $< .05$ ). However, in the moral accidental condition, agent name was only correlated with context details ( $r = .493$ ,  $p = .027$ ). In the neutral intentional condition, agent name is correlated with agent details ( $r = .468$ ,  $p = .037$ ), intention ( $r = .469$ ,  $p = .037$ ), and consequence ( $r = .468$ ,  $p = .037$ ). Finally, in the neutral accidental condition agent name is correlated with all categories except action (all  $p$  values  $< .05$ ). Action was only correlated with agent name in the moral intentional condition, which could be due to the fact that it

would be important to remember both the agent and the action that they performed so that blame and punishment may be assigned to the correct person. While agent name in the moral accidental condition is only correlated with context, agent details are highly correlated with all other categories, which could indicate that participants in this condition are focusing more on details associated with the agent than the agent's name itself. The neutral conditions seem to have lack a straightforward pattern of agent name correlations, which could simply mean that these correlations are happening by chance without a clear explanation.

### **Discussion**

The main goals of this study were to investigate how actions with moral implications might affect people's memory for events especially when these actions were done intentionally. Intentionality appears to be highly linked to morality given that intentionality of an action only had an effect on memory for moral actions. This could indicate that intentionality is an important facet of morality, rather than a completely separate concept when it is encoded in memory.

Although almost all of the results we found were not significant, the trends we found are promising and could become significant if changes are made to the study, which will be further discussed in the limitations. The results we found appear to indicate that intentional moral stories might enhance a participant's memory for certain details of the story. While all of the main effects are just trends, they are trending in the correct direction to make these tentative claims. As we first examined in the results section, participants who received moral intentional stories remembered more information from the story than

any of the other conditions. Moral scenarios improved memory for details about the agent, the action, and the intention, while intentional scenarios improved memory for the agent's name and details about the agent. When looking at these results from an eyewitness testimony standpoint, these are the most relevant pieces of information to remember when determining innocence, guilt, and punishment. Perhaps even more interesting is that intentionality only has an effect on memory when the scenario is also morally charged. This result further supports Kurt Gray's research that intentionality is a vital facet of morality (Gray, Waytz & Young, 2012). There are fewer consequences of neutral actions so whether the action is done intentionally or accidentally is not as important as it is for morally charged actions because there are vital consequences and the intentionality of the action matters a great deal. In the legal realm, intentionality can be the difference between a murder conviction and a manslaughter conviction.

When examining the effect that each story had on a participant's memory, we found that the sixth story led to the most information being recalled and the first story led to the least amount of information being recalled. The sixth story was about an uncle making sandwiches for his two young nieces to take to school. This story could have been remembered better because it is more of an everyday scenario in which someone could find themselves. However, the first story was about a volunteer nurse who is working in a hospital and is in charge of supervising a man on life support. Most people would have a difficult time finding themselves in this scenario, so this could contribute to participants recalling less about this story. This probably cannot account for all of the differences in memory for these two stories, but it is a hypothesis that could potentially be tested in the future. As was previously mentioned in the results section, there could have been a recency

effect where more information was recalled about the first story they read than subsequent stories.

The significant interaction we found between story, category, and morality suggests that morality is linked to greater average recall across the categories. This finding supports the trends that we found with moral scenarios leading to greater memory in general and for the specific categories of agent details, action, and intention. Additionally, there were significant correlations across all four conditions between every information category except for agent name. We found that agent name correlated with the most categories for the moral intention and neutral accidental conditions and had the fewest correlations in the moral accidental condition with the neutral intentional condition having three significant correlations. Speculations can be drawn about these correlations, but what they mainly reveal is that when a participant remembered one piece of information from a story they were likely to remember quite a few pieces of information across all of the categories.

While there is some evidence in previous literature to suggest that English speakers remember the agents of intentional and accidental events equally well, we did not explicitly find this to be the case in our study (Fausey & Boroditsky, 2011). Participants recalled agents' names better for the intentional conditions and they recalled details about the agent best in the moral, intentional condition. These trends indicate that there could be a difference in memory for agents of intentional or accidental actions. A possible reason this could refute previous research is that the actions used in this research were simple actions with one agent, so there was less for a participant to focus on (Fausey & Boroditsky, 2011). However, in our study there were many details in each story that a participant could focus

on. When reading about accidental actions participants focused less on the agent than they did for the intentional actions because this information was less relevant.

Our results do appear to align more with research on memory for helpers or hinderers acting intentionally or unintentionally (Camilleri, 2010). Consistent with what we found, Camilleri found that participants remembered the triangles (agents) that were acting intentionally better than those that were acting unintentionally. Although this study did not look at human behaviors it was focused on both intentionality and morality, unlike Boroditsky's study that just looked at intentionality. Camilleri did not find that the triangle's helping or hindering behavior affected whether participants remembered it or not, but whether a triangle is acting morally or immorally is not as important as a human acting morally or immorally. This could be why we found that morality was a crucial element in recalling more details about an agent.

In addition, studies on the intentionality bias are not relevant here because Rosset (2008) found that people only assumed intentionality for accidental actions under speeded conditions. In our study, the participants had plenty of time to determine whether the actions were intentional or accidental. Rosset also found that participants remembered sentences containing accidental actions better than those containing intentional actions, which was not what we found. We found that intentionality improved memory across a wide range of categories of information present in the stories.

The first limitation is that the study would benefit from acquiring more participants in each condition because the sample size of twenty that we have now does not have as much statistical power as we would like. Second, since there was a significant main effect of story it would be helpful to develop stories that had less variation so that the effect of



morality and intentionality could drive differences in memory rather than the stories themselves. We attempted to create six stories that were all around the same length, but some ended up being slightly longer than others, which could have factored into this variation. Also, certain actions or names could have been more salient in one story as opposed to another or certain contextual details could have been more relevant to a particular story. For example, Paul (the agent of Story 6) may have been more of a familiar name than Sally (the agent of Story 1), or the fact that Paul's niece had a severe peanut allergy could have aided in remembering Paul's actions, whereas the nurse on duty being on a lunch break might not have been as relevant to Sally pulling out the feeding tube. Since these were complex actions, there was no way of knowing whether one action would be remembered better than another. It would be difficult to normalize particular information like the salience of a name, but other measures could have been made to normalize the stories.

Prior to running the study we had not developed a coding process, but if we had we could have made it so each story had the same amount of details for each category. We also could have written stories that contained actions and circumstances that were about the same degree of rarity. It might have also been helpful to collect more demographic information, such as where someone is from because this could have affected whether they remembered where the story took place or not. If they were familiar with the location it would seem as though they would be more likely to remember that location. However, what is clear is that there are many variables that go into what an individual remembers and it would be impossible to control for all of these variables.

Another possible limitation is that we only had one experimenter code up the responses, which could have added an unintentional bias. To improve on this aspect of experimental design we should have had several encoders who were blind to the hypotheses of the study code up the responses. Due to the subjective nature of the coding process having more than one coder could have significantly increased the error scores, but it would have also eliminated experimenter bias. Additionally, there was not one way to code this data, so the results might have improved if another encoding process was used to analyze the data.

One possible future direction is to extend this research to Spanish speakers to look into whether there are not only differences in remembering the agents of intentional and accidental actions, but also of moral and neutral events (Fausey & Boroditsky, 2011). Although there were objects being broken or damaged in the videos in Boroditsky's study, all of the events were morally neutral, lacking any real world consequences. It would be interesting to see whether moral events and actions would improve Spanish speaker's memory for the agent of an action even if it were an accidental action. Based on Boroditsky's hypothesis that language itself creates attentional biases for particular aspects of an action, there could be further research to see if we could manipulate this attention by adding the variable of morality. There is the possibility that the linguistic framing of the Spanish language is so deeply ingrained that even when presented with morally charged, accidental actions where it would be more important to remember the agent, Spanish speakers are still worse at remembering the agent than English speakers. This research could also tell us about how people from different cultures or language backgrounds encode moral actions. They might remember different details from an event than would

English speakers due to their distinct cultural backgrounds. With the population of Spanish speakers increasing in the United States, these differences in encoding and remembering events could have consequences for eyewitness testimony and moral development of bilingual children.

An additional step to this research could be to study how cross-cultural differences in remembering events could affect blame, responsibility, and punishment judgments. Previous research has examined the role of linguistic framing on the distribution of blame and financial liability to an agent (Fausey & Boroditsky, 2010). Like their cross-cultural study, this study too looked at agentive versus non-agentive descriptions and the effect of this linguistic framing on the participants' perception of an event. Legally, this linguistic framing has important consequences for guilty or not guilty verdicts and how an action should be punished. Participants read about an accidental restaurant fire described either using agentive language or non-agentive language. They were then asked how much the subject of the study should be blamed for the fire and how much the subject should pay for the damages. Participants who read the agentive description assigned more blame and financial responsibility to the subject than those participants who read the non-agentive description.

These same results held true even when participants watched a video of Janet Jackson's well-known and controversial wardrobe malfunction at the 2004 Super Bowl halftime show. Even when these participants watched the video, they were still swayed by an agentive or non-agentive description of the event. This study is especially important when looking at this from a legal standpoint. The participants' judgments about blame and financial responsibility were swayed based on linguistic framing even if they had

previously seen the event take place. If participants were presented with stories similar to the ones we tested in the present study, it would be interesting to note whether the information they remembered from the stories during the recall phase would affect how much blame and punishment they assign. A possible hypothesis is that participants who remembered less about the action and agent would assign less blame and responsibility because they do not have enough information to deem more blameworthiness. However, it is also possible that participants who recall less specific details about the event would assign more blame regardless of what they did or did not remember simply because they could not determine that the subject did not deserve a harsher punishment. Furthermore, since the non-agentive framing of the Spanish language affected how well Spanish speakers could remember the agents of accidental events, it is possible that Spanish speakers will not assign as much blame to agents of accidental actions as would English speakers. Due to the effect of linguistic framing on blame and financial responsibility, this has important implications for Spanish speakers' blame and punishment judgments.

Another direction that this research could go is to shorten the encoding time for reading the stories. Generally, participants were fairly successful at remembering certain parts of the story, but with a shorter encoding time their attentional biases toward certain details might be stronger. This could also test how long people need to encode novel scenarios into their short-term memory. In addition, there could be a follow-up to the original study several weeks later to test what information could still be remembered from the stories. It would be interesting to see how memories of third person novel events deteriorate and fade over time and what stays salient in the memory. We could begin to see what information gets stored into long-term memory, not just short-term memory to be

recalled half an hour later. Again, this has implications for eyewitness testimony due to the fact that most witnesses wait weeks or months after a crime to testify in court.

Previous work has used visual representations to test participants' memory in their studies, which could be another direction to take this research (Fausey & Boroditsky, 2011; Wood, 2008). Unlike Boroditsky and Wood though, we could have more complex actions take place in the videos. Neither of their videos consisted of actions that were morally charged, they were simply everyday actions lacking any consequences. However, if we could take our verbally presented stories and present them visually, we might be able to further study attentional biases. Presenting actions visually would also make the results more generalizable to real life situations for which eyewitness testimony would need to be used.

In this study we sought out to investigate the impact of morality and intentionality on memory. Even though we did not find significant results due to several limitations, the trends we did find are promising and suggest important differences in how intentions might be encoded in memory depending on the moral valence. Apart from memory's effect on our day-to-day interactions with the people around us, memory plays a large role in eyewitness testimony and can be the determining factor in a jury deeming a defendant to be innocent or guilty. Discovering how actions are encoded in memory could have profound effects on the efficacy of eyewitness testimony in court cases.

### References

- Camilleri, J. (2010). Remembering helpers and hinderers depends on behavioral intentions of the agent and psychopathic characteristics of the observer. *Evolutionary Psychology, 8*(2), 303-316.
- Conklin, H., Curtis, C., Katsanis, J., & Iancono, W. Verbal working memory impairment in schizophrenia patients and their first-degree relatives: evidence from the digit span task.. *Am J Psychiatry, 157*, 275-277.
- Decety, J., & Cacioppo, S. (2012). The speed of morality: a high-density electrical neuroimaging study. *Journal of Neurophysiology, 108*(11), 3068-3072.
- Gray, K., Waytz, A., & Young, L. (2012). The moral dyad: A fundamental template unifying moral judgment. *Psychological Inquiry, 23*, 206-215.
- Fausey, C., & Boroditsky, L. Subtle linguistic cues influence perceived blame and financial liability. *Psychonomic Bulletin & Review, 17*, 644-650.
- Fausey, C., & Boroditsky, L. (2011). Who dunnit? Cross-linguistic differences in eye-witness memory. *Psychonomic bulletin & review, 18*(1), 150-157.
- Loftus, E. F., & Pickrell, J. E. (1995). The formation of false memories. *Psychiatric Annals, 25*(12), 720-725.
- Malle, B., & Knobe, J. (1997). The folk concept of intentionality. *Journal of Experimental Social Psychology, 33*, 101-121.

Nunez, M., & Harris, P. (1998). Psychological and deontic concepts: Separate domains or intimate connection?. *Mind and Language*, 13(2), 153-170.

Petrides, M. & Milner, B. (1982). Deficits on subject-ordered tasks after frontal- and temporal-lobe lesions in man. *Neuropsychologia* 20(3), 249-262.

Ross, T. P., Hanouskova, E., Giarla, K., Calhoun, E., & Tucker, M. The reliability and validity of the self-ordered pointing task. *Archives of Clinical Neuropsychology*, 22, 449-458.

Rosset, E. (2008). It's no accident: Our bias for intentional explanations. *Cognition*, 108, 771-780.

Wechsler Intelligence Scale for Children - Memory for Digit Span. (n.d.). Retrieved , from [www.nlsinfo.org](http://www.nlsinfo.org)

Wood, J. (2007). Visual working memory for observed actions. *Journal of Experimental Psychology: General*. Vol. 136 (4), pp. 639-652.

Wood, J. (2008). Visual memory for agents and their actions, *Cognition*, 108(2), 522-532.

## Appendix A

### Story 1

*Moral-Intentional:* Sally is an 18-year-old volunteer at a local hospital in Norwich, Connecticut. She volunteers on weekdays from 1-3 PM. While the nurse on duty is taking a short lunch break, Sally is in charge of supervising an unconscious old man on life support. Sally walks up and unplugs his feeding tube, taking the man off of life support.

*Moral-Accidental:* Sally is an 18-year-old volunteer at a local hospital in Norwich, Connecticut. She volunteers on weekdays from 1-3 PM. While the nurse on duty is taking a short lunch break, Sally is in charge of supervising an unconscious old man on life support. Sally trips and unplugs his feeding tube, taking him off of life support.

*Neutral-Intentional:* Sally is an 18-year-old volunteer at a local hospital in Norwich, Connecticut. She volunteers on weekdays from 1-3 PM. While the nurse on duty is taking a short lunch break, Sally is in charge of supervising an unconscious old man on life support. Sally walks up and unplugs her cell phone charger that she keeps nearby.

*Neutral-Accidental:* Sally is an 18-year-old volunteer at a local hospital in Norwich, Connecticut. She volunteers on weekdays from 1-3 PM. While the nurse on duty is taking a short lunch break, Sally is in charge of supervising an unconscious old man on life support. Sally trips and unplugs her cell phone charger that she keeps nearby.



**Story 2**

*Moral-Intentional:* Ben has recently earned his driver's license in the state of Maine, and is frustrated because his parents have been making him give rides to his friends and family.

Ben drives a black Volkswagen Jetta. Ben's sister calls and asks him to pick her up from the parking lot of a local Target. Ben pulls into the lot and sees her standing in the middle of the road. He purposefully hits her, knocking her to the ground.

*Moral-Accidental:* Ben has recently earned his driver's license in the state of Maine, and is frustrated because his parents have been making him give rides to his friends and family.

Ben drives a black Volkswagen Jetta. Ben's sister calls and asks him to pick her up from the parking lot of a local Target. Ben pulls into the lot and does not see her standing in the middle of the road. He accidentally hits her, knocking her to the ground.

*Neutral-Intentional:* Ben has recently earned his driver's license in the state of Maine, and is frustrated because his parents have been making him give rides to his friends and family.

Ben drives a black Volkswagen Jetta. Ben's sister calls and asks him to pick her up from the parking lot of a local Target. Ben pulls into the lot and sees a pothole in the middle of the road. He purposefully hits the pothole. She gets into the car.

*Neutral-Accidental:* Ben has recently earned his driver's license in the state of Maine, and is frustrated because his parents have been making him give rides to his friends and family.

Ben drives a black Volkswagen Jetta. Ben's sister calls and asks him to pick her up from the

parking lot of a local Target. Ben pulls into the lot and does not see a pothole in the middle of the road. He accidentally hits the pothole. She gets into the car.

### **Story 3**

*Moral-Intentional:* Jill is visiting the St. Louis / Zoo on a sunny day in September. Jill enters the reptile house in order to see the rattlesnake, a venomous snake. She notices that there is a lever to open the door of the cage and release the dangerous snake. She pulls the lever causing the door to open and the rattlesnake to escape. The snake bites a small boy who has to be hospitalized.

*Moral-Accidental:* Jill is visiting the St. Louis Zoo on a sunny day in September. Jill enters the reptile house in order to see the rattlesnake, a venomous snake. She notices that there is a lever to open the door of the cage and release the dangerous snake. She trips on the lever causing the door to open and the rattlesnake to escape. The snake bites a small boy who has to be hospitalized.

*Neutral-Intentional:* Jill is visiting the St. Louis Zoo on a sunny day in September. Jill enters the reptile house in order to see the rattlesnake, a venomous snake. She notices that there is a lever that opens a hatch in the snake's cage and releases food to feed the snake. She pulls the lever causing the hatch to open and some food to fall into the cage. The snake eats the food, which then gets slowly digested.

*Neutral-Accidental:* Jill is visiting the St. Louis Zoo on a sunny day in September. Jill enters the reptile house in order to see the rattlesnake, a venomous snake. She notices that there is a lever that opens a hatch in the snake's cage and releases food to feed the snake. She trips on the lever causing the hatch to open and some food to fall into the cage. The snake eats the food, which then gets slowly digested.

#### **Story 4**

*Moral-Intentional:* Jessica receives a text from one of her close friends from high school while she is in a lecture at college in Texas. They had not seen each other since high school and so Jessica is happy to see that she received a text. The text from her friend is a secret that is meant for Jessica's eyes only. Jessica purposefully hits the forward button, sending the text to all of her high school friends.

*Moral-Accidental:* Jessica receives a text from one of her close friends from high school while she is in a lecture at college in Texas. They had not seen each other since high school and so Jessica is happy to see that she received a text. The text from her friend is a secret that is meant for Jessica's eyes only. Jessica accidentally hits the forward button, sending the text to all of her high school friends.

*Neutral-Intentional:* Jessica receives a text from one of her close friends from high school while she is in a lecture at college in Texas. They had not seen each other since high school and so Jessica is happy to see that she received a text. The text from her friend happens to

be a joke that her little sister told her. Jessica purposefully hits the forward button, sending the text to all of her new college friends.

*Neutral-Accidental:* Jessica receives a text from one of her close friends from high school while she is in a lecture at college in Texas. They had not seen each other since high school and so Jessica is happy to see that she received a text. The text from her friend happens to be a joke that her little sister told her. Jessica accidentally hits the forward button, sending the text to all of her new college friends.

### **Story 5**

*Moral-Intentional:* Chris' roommate was walking around their apartment in Miami, when a button from his polo fell off. He asks Chris to sew the button back onto his shirt while he is still wearing the shirt as he is in a hurry to pick up his parents from the airport at noon. As Chris is sewing the button, he pauses and sticks the needle into his roommate's chest.

*Moral-Accidental:* Chris' roommate was walking around their apartment in Miami, when a button from his polo fell off. He asks Chris to sew the button back onto his shirt while he is still wearing the shirt as he is in a hurry to pick up his parents from the airport at noon. As Chris is sewing the button, he slips and sticks the needle into his roommate's chest.

*Neutral-Intentional:* Chris' roommate was walking around their apartment in Miami, when a button from his polo fell off. He asks Chris to sew the button back onto his shirt while he is still wearing the shirt as he is in a hurry to pick up his parents from the airport at noon.

As Chris is sewing the button, he pauses and pokes his roommate's chest with his forefinger.

*Neutral-Accidental:* Chris' roommate was walking around their apartment in Miami, when a button from his polo fell off. He asks Chris to sew the button back onto his shirt while he is still wearing the shirt as he is in a hurry to pick up his parents from the airport at noon. As Chris is sewing the button, he slips and pokes his roommate's chest with his forefinger.

### **Story 6**

*Moral-Intentional:* Paul is the 25 year old uncle of two young girls ages 6 and 3 and is visiting their home in Seattle. The younger of the two girls has a serious peanut allergy. Paul is to prepare sandwiches for his two nieces for their lunches, so he prepares one peanut butter and jelly sandwich and one tuna sandwich. Paul labels the two bags so that his nieces can grab their respective lunches and head off to school. Paul takes the labels and changes them, giving the peanut butter and jelly sandwich to the younger niece.

*Moral-Accidental:* Paul is the 25 year old uncle of two young girls ages 6 and 3 and is visiting their home in Seattle. The younger of the two girls has a serious peanut allergy. Paul is to prepare sandwiches for his two nieces for their lunches, so he prepares one peanut butter and jelly sandwich and one tuna sandwich. Paul labels the two bags so that his nieces can grab their respective lunches and head off to school. Paul mixes up the labels, however, giving the peanut butter and jelly sandwich to the younger niece.

*Neutral-Intentional:* Paul is the 25 year old uncle of two young girls ages 6 and 3 and is visiting their house in Seattle. The younger of the two girls loves all kinds of sandwiches. Paul is to prepare sandwiches for his two nieces for their lunches, so he prepares one peanut butter and jelly sandwich and one tuna sandwich. Paul labels the two bags so that his nieces can grab their respective lunches and head off to school. Paul takes the labels and changes them, giving the peanut butter and jelly sandwich to the younger niece.

*Neutral-Accidental:* Paul is the 25 year old uncle of two young girls ages 6 and 3 and is visiting their house in Seattle. The younger of the two girls loves all kinds of sandwiches. Paul is to prepare sandwiches for his two nieces for their lunches, so he prepares one peanut butter and jelly sandwich and one tuna sandwich. Paul labels the two bags so that his nieces can grab their respective lunches and head off to school. Paul mixes up the labels, however, giving the peanut butter and jelly sandwich to the younger niece.