The Persuasive Power of Computer Animation

in the Courtroom

Senior Honors Thesis

Presented in Partial Fulfillment of the Requirements for Graduation with Distinction in Psychology in the Undergraduate Colleges of The Ohio State University

By

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March, 2005

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Abstract

Results from this study indicate the method of evidence presentation affects relevant dimensions: understanding of evidence and sentence length recommendation. 92 undergraduate participants were presented witness testimony from a murder trial. One third of participants also viewed an animation accompanying the testimony of a key prosecution witness, while another third received still images as visual aids. We did not find significant differences between the animation condition and no-aid condition. We did, however, find significant differences between the still aid condition and no-aid condition. Further research is needed to explore the relationships between methods of evidence presentation and trial outcome.
The Persuasive Power of Computer Animation in the Courtroom

In the last twenty years, the computer has dramatically affected nearly every aspect of American society. As computers have become both more common and more powerful, they have resulted in tremendous change in a wide range of fields including the legal profession and the court system. New technology in the courts has taken many forms, ranging from simple video cameras allowing a piece of evidence to be shown on a monitor in the courtroom (Wachter, 2002; Weinreb, 2001) to the use of computers to create entirely new forms of evidence such as complex computer modeling (Wachter, 2002; Weinreb, 2001). One of the more dramatic, and controversial, uses of technology in court is forensic animation, computer generated video used to illustrate witness testimony. As these animations are potentially powerful tools, assessing the persuasive power they hold is vital to ensuring fair and accurate use of this technology.

One of the first uses of forensic animation was by the Federal Aviation Administration (FAA) and the National Weather Service (NWS) in a civil trial following the 1985 crash of Delta Flight 191 (Z-Axis Website, ¶ 1). The plaintiffs claimed that negligence on the part of the FAA and NWS was to blame for the crash and that both the FAA and NWS should compensate victims and their families. The FAA and NWS believed the pilots had more than enough information to know they should have avoided flying through the storm, blaming solely the flight crew. The FAA and NWS contracted Z-Axis, a pioneering forensic animation firm, to produce an animation nearly an hour in length to illustrate the events leading up to the crash. The animation included illustrations of the cockpit instruments and gauges, explanations of weather phenomena along the flight path, radio transmissions between the crew and ground, and recordings
from the recovered “black box” flight recorder (Z-Axis Website, ¶ 2). Both the FAA and NWS were exonerated and lawyers defending the case described the animation as “pivotal” in their victory (Z-Axis Website, ¶ 4). It is impossible, however, to prove a causal relationship between the use of the animation and the court’s decision. Research is needed to determine whether forensic animation can result in a change in the outcome of a case.

In 1985 the cost of producing a forensic animation was in the range of $1000-$3000 per second (Gold, ¶ 4). Since then, forensic animation has continued to evolve, rapidly becoming both more technologically advanced and more affordable. There are now many firms producing animations for as little as $50 per second, with complete animations often costing under $5000 (C4 Animation Website, ¶ 3; Scientific Animation, ¶ 8), resulting in the birth of a $30 million per year industry (Animation Brings, 2002). The growth of this industry and the increasing presence of forensic animation in the courts indicate a strong need to understand the effect it has on juror decision making.

Many articles have been written to date on technology in the courtroom, including forensic animation, but most have been published as case studies or legal analyses in law reviews. Elan Weinreb’s article in the Cardoza law review (Weinreb, 2001) included discussion of the types of cases in which animation had been used and the outcomes of those trials. The article discusses the legal issues surrounding the use of forensic animation and the past successes and failures of the technology. Weinreb’s article, however, relies solely on observed data to assess the persuasive power of forensic animation. Legal journals understandably focus on the legal arguments such as admissibility and the rules of evidence for forensic animation. However, in order to
make an educated decision on such legal issues as admissibility or evidentiary value it is important to first understand the effectiveness of forensic animation through empirical research.

Social psychologists have studied several aspects of jury decision making but there is no direct research on the persuasive effects of forensic animation. Past studies have looked at how different methods of presenting evidence can change the impact of the evidence. For example, less credible information presented in person has been shown to have more impact than more reliable information presented as data alone (Borgida & Nisbett, 1977). Information that can be easily assembled into a complete and logical story may also be given more weight than information that does not easily reconcile with a larger story (Pennington & Hastie, 1992).

Borgida & Nisbett’s (1977) research studied how different methods of presenting information about university courses to undergraduate students had very different levels of effectiveness on students’ course selection decisions. In their experiment some students received mean course ratings based on the evaluations of students who had previously taken the course. Other students had a brief face-to-face meeting with a previous student to discuss the course. The study found that while the average ratings had virtually no effect on the courses participants chose to take, the face-to-face meeting had a large impact. The authors attributed the difference in persuasion between the two presentation methods to the more vivid nature of the face-to-face contact as compared to the more abstract nature of the statistical information. Forensic animation applies this concept by taking abstract evidence and presenting it in a vivid format.
The research of Pennington and Hastie (1992) also examines psychological processes relevant to the study of forensic animation. They propose a “story telling model” of juror persuasion to enhance the effectiveness of an attorney’s presentation. This model is “based on the hypothesis that jurors impose a narrative story organization on trial information, in which causal and intentional relations between events are central” (Pennington & Hastie, 1992). The story telling model is based the theory that people communicate with stories in everyday life because stories have a stronger impact than abstract ideas alone (Schank & Berman, 2002). Applying this theory in the courtroom predicts that jurors will attempt to assemble all of the evidence presented into the most complete and plausible story by making inferences to connect the evidence and fill in missing information. Each piece of information, as well as each inference, makes up an episode and these episodes are combined to form the best possible story (Pennington & Hastie, 1986; Trabasso & van den Broek, 1985). After hearing opposing testimony, jurors must assign a different value to each episode and the stories they create to reach a verdict.

Pennington and Hastie (1992) suggest two principles that will be considered in choosing one story over another; coverage and coherence. Coverage refers to how well a story takes into account all of the evidence presented at trial. A story that is able to reconcile all of the evidence will be more convincing than one which is unable to do so. Coherence is the degree to which a story is plausible, free from internal contradictions, and complete from beginning to end. When determining the importance of each episode (piece of evidence) while compiling a story, people form “causal networks” to link events into a story (Trabasso & Sperry, 1985). The number of causal relationships between
episodes and the ease of fit into a causal chain that connects the beginning and end of the story being constructed determine the value given to an episode (Trabasso & van de Broek, 1985). If episodes can be easily linked to many other episodes, forming a logical causal chain of events, the resulting story is more likely to be accepted.

After all of the evidence has been presented, jurors consider possible verdicts based on legal instruction from the judge. Jurors will compare the story they have accepted as the best fit for the evidence with possible verdicts (does the story fit all of the necessary elements of the crime?) and then choose the verdict that best corresponds with their story. If the story chosen by a juror is consistent with the elements of the crime “beyond a reasonable doubt” they will return a verdict of guilty. If the story is not acceptably similar to the requirements for a verdict of guilty, jurors will return a verdict of not guilty. Forensic animation can appeal to jurors by presenting a complete chain of events with causal relationships established between all of the evidence.

The ease with which evidence can be linked into causal relationships to form a story can also affect the outcome of a case. In one study, researchers manipulated the order in which evidence was presented to make it easier to form a logical story for one theory over another. This manipulation changed the outcome, with participants favoring the theory with the easier to assemble story (Pennington & Hastie, 1988). Consistent with this experiment, forensic animation presents individual pieces of evidence as contiguous events occurring along a specific timeline, assembling a story with little or no effort required by jurors.

This experiment will take current research a step further by directly studying the effect of forensic animation on juror perception of guilt or innocence, witness credibility,
and evidence comprehension and retention. I anticipate finding that the use of forensic animation will have a strong impact on juror decision making and memory, with jurors favoring the theory laid out by the animation. Regardless of the finding, testing the persuasive power of forensic animations in a laboratory setting will provide objective data that can be applied by legal professionals to make better use of this new technology.

Method

Experimental Design

Participants read trial testimony adapted from an actual murder trial. This testimony was presented alone, accompanied by still illustrations of the crime scene, or accompanied by a short animation of one theory of the crime. The independent variable was the presence or absence of visual aid accompanying the testimony of one of the prosecution’s key witnesses. Following the presentation of evidence, participants responded to a questionnaire measuring their perception on several relevant dimensions: witness credibility, comprehension of the evidence, guilt or innocence of the defendant, and appropriate sentence length.

Participants

Participants (N = 92) consisted of Ohio State University introductory psychology students. Participants were randomly assigned to one of three experimental conditions.

Materials

Transcript: Actual testimony from Serge v. Commonwealth of Pennsylvania (Serge v. Commonwealth of Pennsylvania) was used as the basis for all simulated/reproduced testimony presented. In the selected case, the defendant, Michael
Serge, was tried and convicted for the murder of his wife. During the trial the prosecution presented an animation to the jury illustrating what the district attorney believed to be an accurate portrayal of the events that took place in the Serge home as the murder was committed. The transcript was analyzed and condensed to allow the presentation of key arguments for both the prosecution and defense during the experimental session. (See Appendix I for transcript).

Forensic Animation: The forensic animation that was used as an independent variable is a one-minute video prepared by 21st Century Animation to accompany the testimony of a prosecution witness in the Serge trial. The video provides an animated interpretation of the evidence collected at the murder scene. It recreates the prosecution’s theory of the crime, explaining the locations of the defendant and decedent at the scene and the trajectory of each bullet fired. The same written testimony used in the “forensic animation absent” condition accompanied the animation.

Still Images: Still images used to illustrate witness testimony in the “photographic aid” condition were captured from the forensic animation. Three still images were included, illustrating each of the three shots fired during the homicide. The same testimony presented in the other conditions accompanied the images. (See Appendix IV for still visual aids).

Questionnaires: Each participant completed a questionnaire presented on a computer using MediaLab software. Participants self reported their perceptions of witness credibility, likelihood of guilt or innocence, the relative weight given to specific witness’ testimony and the perceived importance of the forensic animation. All conditions received identical questions, with the exception of questions specifically
relating to the animation or photos, which were included only in the corresponding conditions. (See Appendix II for specific questions).

**Procedure**

The experiment was conducted in a laboratory setting to better control for extraneous variables. Participants were led into the laboratory by an experimenter and assigned at random to one of the three experimental conditions. The experimenter read the instructions and informed participants of their rights as subjects. Participants then read testimony presented via MediaLab software, with the appropriate visual aids. After viewing the presentation participants completed a short questionnaire assessing their perceptions of the case. Upon completing the questionnaire, participants were reminded not to discuss the experiment with anyone else.
Results

Data were analyzed using SPSS statistical software using ANOVA and linear regression analysis techniques. This strategy allows us to look at between-group differences, as well as investigating the impact of evidence presentation on comprehension, guilt or innocence, and other relevant dimensions.

The strongest effect ($F_{2,89} = 4.743, p = .011$) was seen in subject’s reported level of understanding$^1$. Understanding was greatest in the forensic animation condition ($M = 5.96, SD = .859$), lowest in the still aid condition ($M = 5.13, SD = 1.189$), with the no aid condition falling in between ($M = 5.60, SD = 1.003$). Post hoc analysis using Tukey HSD was used to compare differences between the means of each condition more directly with the means of other conditions. This analysis showed that the significant difference found in the preliminary ANOVA existed between the “no aid” and “still aid” conditions only ($p=.009$).

Statistically significant results ($F_{2,89} = 3.50, p = .034$) were also seen in the length of sentence recommended$^2$. Participants in the no aid condition recommended the longest sentences ($M = 5.10, SD = 1.125$). Participants in the animation condition recommended shorter sentences ($M = 4.63, SD = 1.313$). Participants in the still aid condition recommended the shortest sentences ($M = 4.29, SD = 1.313$). Post hoc analysis using Tukey HSD was used to compare differences between the means of each condition more directly with the means of other conditions. This analysis showed that the significant difference found in the preliminary ANOVA again existed only between the “no aid” and “still aid” conditions ($p=.026$).

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$^1$ See Appendix II Question 3  
$^2$ See Appendix II Question 7
No other measures produced statistically significant findings. See Appendix III for data analysis tables for all of the dependent measures.

Discussion

We found that there are significant changes in participants’ responses when the same information is presented through different means. The significant results, however, were not what we hypothesized. Animation presented by the prosecution failed to raise understanding, change verdict outcome, or increase sentence length. In addition, finding that the use of still aids lowered understanding and reduced sentence length is contrary to our expectation that the more information provided to participants, the greater the strength of the case.

One possible explanation for finding no change between the no-aid and animation conditions is participant reactance to viewing only one animation. This animation was prepared and presented by the prosecution, who clearly had an interest in influencing the outcome of the case. Participants may have seen the animation as an “over the top” way of telling them how to think about the case, and shifted their views in favor of the defense.

It is also possible that by providing more information there was a “humanizing” effect, causing participants to empathize with the defendant due to his starring role in the animation. If this is indeed the case, we would expect to see a lower conviction rate and shorter sentences in the animation condition than in the no aid condition. Our findings do
not show this, however it is possible that sympathy for the defendant cancelled out some degree of persuasive effect from the animation resulting in no net effect.

The lower level of understanding found in the still aid condition is not what was expected, but could be consistent with the story telling model proposed by Pennington and Hastie. The still images may have provided information which was difficult for participants to fit in to their understanding of the case. Taken out of the animation, the images became pieces of evidence that no longer fit nicely together as episodes. In contrast, the continuous nature of the animation created an easy to understand storyline which included each piece of evidence. Under this model, the no aid condition could have benefited through its simplicity, with fewer pieces for participants to fit together.

Another potential reason for lower understanding in this particular case is the absence of the knife the victim was allegedly wielding in the still images. Participants heard expert testimony from the defense about a knife help by Mrs. Serge during the homicide, but it was not present in the still photos (or in the animation from which they were taken). The conflict between the testimony about this piece of physical evidence by the defense and its exclusion from the still images may have lowered juror comprehension and led to correspondingly shorter sentence recommendations. However, if this were the case we would expect to see a similar drop in understanding in the video condition relative to the control. It is possible that the additional information provided in the video counterbalanced the confusion caused by the knife contradiction, resulting in no net change from the control when viewing the animation. Further investigation, through custom animation creation, is needed to explore this relationship.
These findings suggest forensic animation should be used with caution, as the way jurors react to an animation may be unpredictable. The animation presented in this study was prepared by the prosecution to illustrate their theory of the crime. Providing “jurors” with the same information in different formats led to different outcomes on some scales, but in this experiment the changes were not what we expected. Further study is needed to understand how the use of forensic animation affects juror’s decisions.

One potential avenue for future research is to compare the effect of an animation presented by the prosecution with an animation presented by the defense. The results of this study could provide further insight into any juror reactance and the role it may play in countering the animations intended effect by allowing a direct comparison.

Another area to be addressed in future research is the method in which evidence is presented. Presenting evidence through recorded video testimony may be valuable. This would provide a more realistic method of presentation and also create greater consistency between conditions. In our experiment only the animation condition received audio and video. Presenting evidence through video to all conditions may make any effect of the animation more apparent.

Conclusion

At the beginning of this experiment we hypothesized that presenting a forensic animation to accompany witness testimony would increase the strength of the presenting side’s case. We anticipated finding greater understanding and a greater conviction rate when an animation was presented by the prosecution. We did not find this to be the case,
however future research is needed to determine why as well as what can be done to present animations in the courtroom more effectively.

While we did not find significant changes in outcome when presenting a forensic animation, gaining a greater understanding of how forensic animation affects jurors’ decisions remains important from both a practical and ethical standpoint. From the practical standpoint understanding how and when to use forensic animation will allow attorneys and their clients to present the best possible case and make the most of available resources. Although the cost of producing an animation has dropped rapidly, their production remains beyond the reach of most people. This study is only a beginning and further research will allow us to be more confident that the courtroom remains fair and impartial to all sides involved.
References


Appendix I

Transcripts

Condition One – No Aids

Thank you for participating in our experiment today. You will be reading about a court case and making various judgments about it. Your participation should take no more than 30 minutes.

Before we begin the study, we need to let you know about your rights as a participant. First, you have the right to withdraw from the study at any time without penalty. Second, you do not have to answer any questions that make you uncomfortable. Finally, any data you provide us will be kept completely confidential.

Do you have any questions for me before you begin?

You will be reading trial testimony from a homicide case. You will read as both the prosecution attorney (abbreviated P) and the defense attorney (abbreviated D) question witnesses (abbreviated W). After reading all testimony you will complete a short questionnaire. Thank you for participating in this experiment.

Prosecution Questions Dr. Gary Ross

P: Dr. Ross, could you tell the jury what your current occupation is?

W: I am the coroner for Lackawanna County.

P: How long have you been so employed?

W: Since September 1975.

P: And in the course of your job you regularly make determination as to the cause of an individual’s death?

W: Yes

P: How many homicides have you investigated?

W: Approximately 100.

P: And were you able to determine a cause of death?
W: Mrs. Serge died as a result of two gunshot wounds, one to the abdomen and one to the left arm.

P: Can you tell us anything else about the details of Mrs. Serge’s death?

W: She was first shot in the lower back from a distance of 3 to 5 feet as she was walking away from her assailant. As the first bullet exited her abdomen, Mrs. Serge collapsed to her knees at which time she was shot again in the right arm. The second bullet which struck Mrs. Serge traveled through her right upper arm and into her chest cavity where it pierced her heart and lungs before exiting the left side of her body. The second bullet proved to be fatal and caused her to fall face first to the floor, as a result of which she suffered a circular abrasion on her left cheek from impact with her eyeglass lens.

P: In January 2001 did you examine the body of Jennifer Serge?

W: Yes.

Defense Cross Examination of Dr. Gary Ross

D: Is it possible that the shot to the lower back was the second shot fired?

W: The trajectory of the bullet which passed through her arm leads me to believe that she was hit while lying on the ground. It is unlikely she would have been able to stand after such an injury, so this shot was likely fired last.

D: Unlikely? So you are telling us that it is possible that the fatal shot may have been fired first?

W: Anything is possible, but it seems highly unlikely in my analysis.

D: But not impossible, no further questions of this witness.
Prosecution questions State Trooper Bradley Beach

P: How long have you been with the PA state police?

W: 18 years.

P: How long have you been a crime scene reconstructionist?

W: 6 years.

P: Please describe for the jury what you do in your capacity as a crime scene reconstructionist.

W: I analyze the scene of a crime to determine the sequence of events that occurred. By examining evidence at the scene, such as the angle of bullet entry, patterns of blood splatter, position of the victim and other physical evidence it is possible to accurately recreate the event.

P: After examining the crime scene in the Serge home were you able to come to a conclusion as to what occurred at the time of the shooting?

W: Yes, by examining bullet trajectories, blood splatter, and position of the victim's body I determined that three shots were fired with the first bullet fired passing through Mrs. Serge’s lower back, exiting through her abdomen and lodging in a stereo system. Mr. Serge fired a second shot which missed and passed through the wall of the home to the outside. Mrs. Serge fell to her knees where the Mr. Serge fired a third time, striking her in the right arm. The bullet traveled through the right thoracic cavity, transected the pericardium, then exited through the left back before coming to rest in base of the Serge’s television set.

Defense cross-examination of State Trooper Bradley Beach

D: You testified that you work for the PA state police as a crime scene reconstruction specialist?

W: That is correct.
D: In your capacity as a crime scene reconstructionist, how many murders have you analyzed?

W: One.

D: One in addition to the Serge murder?

W: The Serge case was my first homicide reconstruction

D: During your investigation, did you recover a knife at the scene?

W: Yes, we did.

D: Where did you find this knife?

W: It was lying on the ground next to Mrs. Serge.

D: I see, was there blood on the knife?

W: Yes, there was blood splatter from the gunshots on one side of the knife.

D: Only on one side?

W: The blood splatter was only found on one side of the knife.

D: And what about Mrs. Serge's palm, did you find blood there?

W: Her palm was free of blood.

D: Is it possible that Mrs. Serge was holding the knife at the time she was shot? Would that explain the presence of blood on the knife and its absence on her palm?

W: That is possible, but I do not believe it is the case here.

D: But it is possible. So it is also possible that she was using the knife to attack the defendant at the time she was shot?

W: I guess it is possible.

D: I see. No further questions of this witness.
Prosecution re-direct for State Trooper Bradley Beach

P: In your career, how many crime scenes have you reconstructed in all?

W: Over 100.

P: What type of crime scenes have you reconstructed in the past?

W: Primarily traffic accidents.

Defense calls Dr. George Jackson

D: What is your occupation?

W: I am a medical doctor at Lackawanna County General Hospital specializing in substance abuse disorders. I have been practicing for 15 years.

D: Does your work involve the treatment of alcohol abuse?

W: Yes.

D: So you are familiar with the effects of alcohol and alcohol intoxication?

W: Yes.

D: Having examined the defendant’s medical record, were you able to reach any conclusion?

W: Yes, based on the BAC of .10 nine hours after the shooting the defendant would have had a BAC of between .235 and .325 at the time of the shooting.

D: What does this tell you about the defendant’s mental state at the time?

P: Objection, calls for conclusion.
D: I will rephrase the question your honor. In your expert opinion, what are the probable effects of alcohol intoxication at a BAC in the range of .235 and .325?

W: At those levels a person would experience impairment to judgment, alertness, memory, response time and normal sense of care and caution.

D: So their ability to make informed decisions would be impaired?

W: Yes.

Prosecution cross-examination of Dr. George Jackson

P: Did you actually observe the defendant in an intoxicated state on the night in question?

W: No.

P: So your opinion is based on the assumption that the defendant’s reaction to alcohol is within a certain set of standard guidelines.

W: That is correct.

P: Are the guidelines 100% accurate? Is it possible for someone with a BAC of .235 to be less intoxicated than the average individual would?

W: It is possible.

P: Have you performed any tests on Mr. Serge to determine whether or not he has a typical response?

W: No, I examined the medical report taken at the time of his arrest.

P: During a previous hospital admission Mr. Serge was found to have a BAC of .483 to .510, and was conscious and conversant at the time. Does Mr. Serge’s ability to survive a BAC of .5, let alone being able to hold a conversation at the time, put him outside the curve you used to determine his level of intoxication?

W: Being conscious at with a .5 BAC would put Mr. Serge outside the normal range of response to alcohol intoxication, yes.
Defense calls Dr. Daniel Kessler

D: Dr. Kessler, would you tell us what you do for a living?

W: I am a forensic crime scene reconstructionist.

D: Tell us about your education and other qualifications in your role as a forensics expert.

W: I have a PhD in physics and an MD, both from Princeton University. I also have over 20 years of experience conducting forensic investigations.

D: How many crimes have you worked?

W: Hundreds.

P: Given this information, does it seem likely that he would be severely intoxicated with a BAC of .235?

W: It doesn’t seem likely, no.

D: And in how many of those crimes did you testify on behalf of the defendant?

W: In less than 25 percent of them.

D: Turning to Mr. Serge’s case, have you had a chance to examine the physical evidence from this case?

W: Yes, I examined the photos taken by the police and medical examiner. I also read the police reports and examined the crime scene myself.

D: As you know, Mr. Serge is accused of murdering his wife. He has alleged that he was acting in self defense after his wife attacked him with a knife. In the course of your investigation did you find anything to support this claim?

W: Yes, there was a butcher’s knife 12” in length on the floor at the scene of the crime.

D: Is it possible that Mr. Serge placed the knife at the scene after killing Mrs. Serge?
W: No, the high velocity blood splatter on the knife handle is very distinctive. If he had tried to smear the knife with blood after killing Mrs. Serge we would expect to see a very different pattern.

D: Thank you.

Prosecution Cross Examines Dr. Daniel Kessler

P: Is there any way to know whether or not Mrs. Serge was actually trying to harm Mr. Serge with the knife.

W: She was holding it at the time she was shot.

P: So all you can tell us is that it was in her hand, she wasn’t necessarily trying to stab the defendant with it?

W: No.

P: Thank you, no more questions.

Condition II – Forensic Animation³

Prosecution questions State Trooper Bradley Beach

P: How long have you been with the PA state police?

W: 18 years.

P: How long have you been a crime scene reconstructionist?

W: 6 years.

P: Please describe for the jury what you do in your capacity as a crime scene reconstructionist.

W: I analyze the scene of a crime to determine the sequence of events that occurred. By examining evidence at the scene, such as the angle of bullet entry, patterns of blood splatter, position of the victim and other physical evidence it is possible to accurately recreate the event.

³ Only the testimony of Trooper Bradley Beach differs from testimony provided in other conditions. All testimony is identical.
P: After examining the crime scene in the Serge home were you able to come to a conclusion as to what occurred at the time of the shooting?

W: Yes, by examining the angle of the bullet trajectories, blood splatter, and position of the victims body I determined that three shots were fired with the first bullet fired passing through Mrs. Serge’s lower back, exiting through her abdomen and lodging in a stereo system. Mr. Serge fired a second shot which missed and passed through the wall of the home to the outside. Mrs. Serge fell to her knees where the Mr. Serge fired a third time, striking her in the right arm. The bullet traveled through the right thoracic cavity, transecting the pericardium, then exited through the left back before coming to rest in face of the Serge’s television set.

P: At this time I request the court’s permission to play a recreation of the crime for the jury.

D: Objection, relies on facts not in evidence, calls for speculation, and is unduly prejudicial.

Judge: Overruled

P: Thank you your honor. Members of the jury, this animation will recreate the crime based on careful measurements of the crime scene and Trooper Bradley’s expert opinion.

< Forensic animation played here >

Condition III – Still Visual Aids

Prosecution questions State Trooper Bradley Beach

P: How long have you been with the PA state police?

W: 18 years.

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4 Only the testimony of Trooper Bradley Beach differs from testimony provided in other conditions. All testimony is identical.
P: How long have you been a crime scene reconstructionist?

W: 6 years.

P: Please describe for the jury what you do in your capacity as a crime scene reconstructionist.

W: I analyze the scene of a crime to determine the sequence of events that occurred. By examining evidence at the scene, such as the angle of bullet entry, patterns of blood splatter, position of the victim and other physical evidence it is possible to accurately recreate the event.

P: After examining the crime scene in the Serge home were you able to come to a conclusion as to what occurred at the time of the shooting?

W: Yes, by examining the angle of the bullet trajectories, blood spatter, and position of the victim’s body I determined that three shots were fired with the first bullet passing through Mrs. Serge’s lower back, exiting through her abdomen and lodging in a stereo system as illustrated in people’s exhibit A (indicating).

< Still aid 1 presented here >

W: Mr. Serge fired a second shot, which missed Mrs. Serge and passed through the wall of the home to the outside as shown in People’s exhibit B.

< Still aid 2 presented here >

W: Mrs. Serge fell to her knees where the Mr. Serge fired a third time, striking her in the right arm. The bullet traveled through the right thoracic cavity, transecting the pericardium, then exited through the left back before coming to rest in face of the Serge’s television set. People’s C shows the path of this final, fatal shot.
Appendix II

Questionnaire\(^5\)

1. How credible did you find prosecution witness Trooper Bradley Beach

   1  2  3  4  5  6  7
   Not at all  Completely

2. How credible did you find defense witness Dr. Daniel Kessler?

   1  2  3  4  5  6  7
   Not at all  Completely

3. How well do you feel you understood all of the evidence presented?

   1  2  3  4  5  6  7
   Not at all  Completely

4. Do you feel the defendant is more likely innocent or guilty?

   Not Guilty / Guilty

5. How certain are you about the defendant’s guilt or innocence?

   1  2  3  4  5  6  7
   Not at all  Completely

6. Is the defendant guilty beyond a reasonable doubt?

   Yes / No

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\(^5\) These questions will be presented to all participants in all conditions except as otherwise noted.
7. What length of sentence do you feel would be appropriate in this case?\(^6\)

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<tr>
<th>Minimum Permitted</th>
<th>Maximum Permitted</th>
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<tr>
<td>By Law</td>
<td>By Law</td>
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8. Did the animation aid your understanding of Trooper Beach’s testimony?\(^7\)

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<tr>
<th>Not at all</th>
<th>Very much</th>
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8. Did the photos aid your understanding of Trooper Beach’s testimony?\(^8\)

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<tr>
<th>Not at all</th>
<th>Very Much</th>
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9. Is there anything else about the way you reached your decisions that you feel we should know?

In all conditions, participants provided an essay response to question nine.

\(^6\) Participants responded to this question whether or not they believed the defendant was guilty beyond a reasonable doubt.

\(^7\) Animation condition only.

\(^8\) Still photo condition only.
Appendix III

Table 1

Between-Subjects Factors

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<th>Condition</th>
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<td>No Aid</td>
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<td>Animation</td>
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<td>Still Image</td>
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</table>

9 See Appendix II for corresponding questions.
Table 2
Mean and Standard Deviation

<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
<th>No Aid</th>
<th>Animation</th>
<th>Still Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 (Prosecution Witness Credibility)</td>
<td>1 = Not at all, 7 = Completely</td>
<td>M = 4.2</td>
<td>M = 4</td>
<td>M = 3.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SD = 1.12</td>
<td>SD = 1.41</td>
<td>SD = 1.31</td>
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<tr>
<td>Q2 (Defense Witness Credibility)</td>
<td>1 = Not at all, 7 = Completely</td>
<td>M = 5.13</td>
<td>M = 5.25</td>
<td>M = 4.99</td>
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<td></td>
<td>SD = .9</td>
<td>SD = .897</td>
<td>SD = 1.01</td>
</tr>
<tr>
<td>Q3 (Understanding)</td>
<td>1 = Not at all, 7 = Completely</td>
<td>M = 5.60</td>
<td>M = 5.96</td>
<td>M = 5.13</td>
</tr>
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<td>SD = 1.00</td>
<td>SD = .859</td>
<td>SD = 1.19</td>
</tr>
<tr>
<td>Q4 (More likely guilty / not guilty)</td>
<td>1 = Not Guilty, 2 = Guilty</td>
<td>M = 1.90</td>
<td>M = 1.88</td>
<td>M = 1.79</td>
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<tr>
<td></td>
<td></td>
<td>SD = .305</td>
<td>SD = .338</td>
<td>SD = .413</td>
</tr>
<tr>
<td>Q5 (Certainty)</td>
<td>1 = Not at all, 7 = Completely</td>
<td>M = 4.53</td>
<td>M = 5.00</td>
<td>M = 4.42</td>
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<td></td>
<td>SD = 1.502</td>
<td>SD = .933</td>
<td>SD = 1.03</td>
</tr>
<tr>
<td>Q6 (Beyond a reasonable doubt)</td>
<td>1 = Guilty, 2 = Not Guilty</td>
<td>M = 1.60</td>
<td>M = 1.75</td>
<td>M = 1.76</td>
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<td></td>
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<td>SD = .498</td>
<td>SD = .442</td>
<td>SD = .431</td>
</tr>
<tr>
<td>Q7 (Length of Sentence)</td>
<td>1 = Minimum, 2 = Maximum</td>
<td>M = 5.10</td>
<td>M = 4.63</td>
<td>M = 4.29</td>
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<td>SD = 1.125</td>
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<td>Q8 (Aid Value)</td>
<td>1 = Not at all, 2 = Very Much</td>
<td>M = 5.92</td>
<td>M = 5.63</td>
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<tr>
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<td></td>
<td>SD = 1.38</td>
<td>SD = 1.17</td>
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</table>
Table 3

Tests of Between-Subjects Effects (ANOVA)

<table>
<thead>
<tr>
<th>Question</th>
<th>F</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
<td>Q1 (Prosecution Witness Credibility)</td>
<td>1.248</td>
<td>0.292</td>
</tr>
<tr>
<td>Q2 (Defense Witness Credibility)</td>
<td>2.904</td>
<td>0.060</td>
</tr>
<tr>
<td>Q3 (Understanding)</td>
<td>4.743</td>
<td>0.011</td>
</tr>
<tr>
<td>Q4 (More likely guilty / not guilty)</td>
<td>0.875</td>
<td>0.421</td>
</tr>
<tr>
<td>Q5 (Certainty)</td>
<td>1.849</td>
<td>0.163</td>
</tr>
<tr>
<td>Q6 (Beyond a reasonable doubt)</td>
<td>1.217</td>
<td>0.301</td>
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<tr>
<td>Q7 (Length of Sentence)</td>
<td>3.500</td>
<td>0.034</td>
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Table 4

Post Hoc (Tukey HSD)

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<tr>
<th>Dependent Variable</th>
<th>(I) Condition</th>
<th>(J) Condition</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval for Mean Differences</th>
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<td>Lower Bound</td>
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<tr>
<td>Q3 (Understanding)</td>
<td>No Aid</td>
<td>Animation</td>
<td>-0.358</td>
<td>0.288</td>
<td>0.431</td>
<td>-1.045</td>
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<td>Stills</td>
<td>0.468</td>
<td>0.257</td>
<td>0.168</td>
<td>-0.144</td>
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<tr>
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<td>No Aid</td>
<td>0.358</td>
<td>0.288</td>
<td>0.431</td>
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<td>0.009</td>
<td>0.173</td>
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<td>Stills</td>
<td>No Aid</td>
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<td>0.257</td>
<td>0.168</td>
<td>-1.081</td>
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<tr>
<td></td>
<td>Animation</td>
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<td>-0.827</td>
<td>0.274</td>
<td>0.009</td>
<td>-1.481</td>
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<tr>
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<td>No Aid</td>
<td>Animation</td>
<td>0.475</td>
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<td>0.355</td>
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<td>0.026</td>
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<td>-0.336</td>
<td>0.327</td>
<td>0.563</td>
<td>-1.115</td>
</tr>
</tbody>
</table>
Appendix IV

Still Visual Aids

Still Aid 1
Still Aid 2
Still Aid 3