WITNESS PREPARATION TRAINING: EYE TRACKING METHODS TO DETERMINE DIFFERENCES BETWEEN NAÏVE OBSERVERS AND TRAINED RATERS

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by

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DEDICATION

This dissertation is dedicated to the one and only Grandfather, Dr. Ralph Herman Gremillion. His grandfatherly suggestions motivated me to "have the gumption to stick it out."

ABSTRACT

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Purpose: The purpose of this research was to use eye tracking methodology to determine what potential jurors look at when they watch someone give courtroom testimony, if what they look at depends on the witness' nonverbal behavior, whether certain nonverbal behaviors might distract jurors from processing the content of the witness' testimony and lead them to perceive the testimony as ineffective, and whether the behaviors that jurors look at change once a witness has undergone witness preparation training. I hypothesized that potential jurors would look at nonverbal behaviors that were unrelated to testimony content. Looking at these behaviors would be related to lower ratings of credibility and testimony quality and less comprehension of testimony content. I expected that witness preparation training would be related to the use of fewer unrelated nonverbal behaviors, more effective testimony, and greater comprehension of testimony content.

Methods: Participants (jurors $N = 100$) were randomly assigned to one of three testimony conditions: audio only testimony, video only testimony, video+audio testimony. Jurors wore an eye tracking camera to determine the location of their visual attention while watching and/or listening to eight videotaped segments of simulated courtroom testimony. Jurors then evaluated witness credibility and testimony quality immediately following each witness' testimony.

Findings: Findings from the current study provided some support for witness preparation training by showing that jurors are less likely to fixate on non-head areas of

prepared witnesses and that fixations in non-head areas are moderately associated with perceived credibility and testimony quality. Training was related to increased ratings of credibility and testimony quality. Fixations in non-head areas were differentially related to credibility and testimony quality ratings based on study condition. Specific information about the effect of reducing fidgeting on improving juror ratings is difficult to interpret given the differences in findings for each defendant; however, there is some support that reducing fidgeting increased defendants' testimony delivery quality.

KEY WORDS: witness preparation training, eye tracking, visual attention

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INTRODUCTION

Introduction

Many witnesses undergo witness preparation training before they testify in court. A primary focus of witness preparation is to teach potential witnesses to use nonverbal behaviors that facilitate communication (e.g., gestures), but to avoid nonverbal behaviors that might be perceived as signs of deception (fidgeting, poor eye contact) or some other negative characteristic (e.g., poor posture). The main goal of changing these behaviors through witness preparation is to produce witnesses who are viewed by others as believable, trustworthy, and honest.

Much of the existing witness preparation research focuses on the influence of witness preparation training programs as a whole, which are usually tailored to the individual witness and aim to change multiple verbal and nonverbal behaviors (Boccaccini, Gordon, & Brodsky, 2005; Spanos, Quigley, Gwynn, Glatt, & Perlini, 1991; Wells, Ferguson, & Lindsay, 1981). Although these studies generally show positive improvements as a result of witness preparation, they say very little about which behaviors are most influential for increasing the perceived credibility of witnesses.

Witness preparation involves considerable time and cost to attorneys and witnesses, and multifaceted witness preparation training programs often require several training sessions and changes in multiple behaviors. Some researchers in this area have speculated that more focused witness preparation training programs, focusing on a small subset of behaviors, may be as or more effective than multifaceted approaches (Boccaccini et al., 2005). The important question for proponents of this type of

streamlined approach is which behavior or small subset of behaviors should be targeted for training? Although researchers have conducted numerous experimental studies examining the impact of manipulating a single nonverbal behavior on observers' judgments, findings from these studies have limited generalizability to witness testimony as a whole, which involves complex combinations of verbal and nonverbal behaviors. In addition, although these studies provide valuable information about whether or not individual behaviors may have strong influences on observers' perceptions, they do not directly identify the most influential behaviors within a larger set of all nonverbal and verbal behaviors.

The current study will use a different and relatively new methodology to identify witness behaviors in dynamic courtroom testimony that capture observers' visual attention. Specifically, the current study will use eye tracking equipment to determine exactly which behaviors potential jurors look at when they watch witness testimony and to examine the relation between what jurors look at and their perceptions of the witnesses. The current study will also examine whether witness preparation designed to modify nonverbal behavior is associated with a change in the behaviors that jurors look at when viewing testimony.

Nonverbal Behaviors During Witness Testimony

Nonverbal behaviors constitute an important part of communication in general. These behaviors operate in conjunction with verbal communication to enhance or detract from the content of a person's message; this occurs in multiple settings, including witness testimony. (For a detailed review see Boccaccini, 2002; Gordon & Fleisher, 2006). Several types of nonverbal behavior are thought to be especially important during

courtroom testimony. These behaviors are those that lay observers often associate with lying, such as avoiding eye contact and general signs of anxiety (fidgeting, posture shifts, rigidity). These and other behaviors are also described in models of deception detection like Interpersonal Deception Theory and the Four-Factor Model of Behavioral Cues to Deception (Burgoon & Buller, 1994; Zuckerman & Driver, 1985). This section provides a brief overview of some of these nonverbal behaviors and research relating to their influence on witness testimony.

Eye contact and gaze can enhance or impede the effectiveness of witness testimony. Maintaining appropriate eye contact, especially while speaking, may be important in a courtroom setting (Leathers, 1997) because confident persons maintain good eye contact while speaking (Dovidio, Ellyson, Keating, Heltman, & Brown, 1988). Raters view witnesses who avoid eye contact as less effective than witnesses who look at the examining attorney during questioning (Hemsley & Doob, 1978). Maintaining appropriate eye contact also involves avoiding staring. Kleinke (1986) suggested a curvilinear relation between eye contact and positive evaluations of individuals; moderate amounts of eye contact were related to characteristics of credibility whereas too little or too much eye contact were related to negative characteristics. Interrogators may view suspects who hold their gaze for too long as insincere or as attempting to assert dominance (Gordon & Fleisher, 2006). Similarly, jurors may view witnesses who stare at the examining attorney as insincere.

Apart from facial movements, body movements can also enhance or detract from the effectiveness of a witness' testimony. Nonverbal behaviors can be categorized based on level of association with the speaker's message. Categories of nonverbal behaviors

include emblems, illustrators, and adaptors (Gordon & Fleisher, 2006). *Emblem* refers to nonverbal behaviors that relay a specific message without the use of words (i.e. shrugging shoulders and shaking head to communicate "I don't know"). In a courtroom setting, the use of emblems is discouraged because a court reporter must document all communication; therefore, witnesses are instructed to give verbal answers to questions. The term *illustrator* describes movements that enhance a speaker's message and help the listener understand what the speaker said (Gordon & Fleisher, 2006; Leathers, 1997). For example, a speaker describing the size of an object may illustrate that message by holding his hands apart to approximate size. Illustrators are important in accenting a message and increasing the power of the message and may be beneficial in a courtroom setting. *Adaptors* are body movements that not only fail to enhance a speaker's message, but also may detract from the message by distracting the listener. The act of using adaptors frequently is commonly called fidgeting (Mehrabian & Friedman, 1986). As the use of adaptors increases, the likelihood that the speaker is being truthful may decrease (Gordon & Fleisher, 2006). Evaluators may interpret combinations of ineffective nonverbal behaviors, such as fidgeting and poor eye contact, as nervousness (Leathers, 1997). Researchers videotaped mock eyewitnesses giving identification testimony about a photograph (Bothwell & Jalil, 1992). Mock jurors rated nervous witnesses as less confident and less accurate than other witnesses.

Witness Preparation

Boccaccini (2002) suggests that witness preparation can be broken down into three components: witness education, attorney education, and modification of testimony delivery. Witness education involves orienting the witness to his or her prior testimony

and to the court culture. Orientation of the witness can involve anything from reviewing prior statements and visiting a courtroom to completing a virtual courtroom software program to educate the witness about who the major players are in the court (Cooke, Laczny, Brown, & Francik, 2002). Attorney education involves the attorney becoming familiar with the witnesses' testimony and using this knowledge to plan trial strategy (Boccaccini, 2002). Modification of testimony delivery is the area of witness preparation that is often the focus of trial consultation.

Modification of testimony delivery includes modifying both verbal and nonverbal witness behaviors. Numerous testimony delivery skills are believed to be modifiable through witness preparation. Common suggestions for the effective use of testimony delivery skills include being honest, speaking clearly, being comfortable with answering "I don't know," avoiding rambling responses to attorneys' questions, making eye contact with attorneys and jurors, maintaining good posture, and avoiding any behavior that may be interpreted as a sign of deceit (e.g., fidgeting, vocal pauses). All of these suggestions are intended to help witnesses appear credible and persuasive.

Witnesses are generally prepared to testify by attorneys and/or consultants using some level of instruction and rehearsal of testimony (Boccaccini et al., 2005). Witnesses are instructed to dress appropriately for court and to be well groomed (McElhaney, 1987; Nelson, 1999). Presentation of the testimony message includes all aspects of behavior in the courtroom, including appearing credible. Witnesses are also instructed on variations of posture, eye contact, movement, and speech patterns that have been found to be more effective in communicating. Witnesses are reminded to tell the truth, be firm and humble, to watch out for lawyer's tricks, be responsive to questions without offering to

produce information, and correct mistakes quickly, all while maintaining their natural personality in the testimony (Cohen, 2000). In addition to these rules, witnesses are expected to communicate their testimony effectively.

Testimony rehearsal is useful in preparing witnesses, not to alter the content of their testimony, but to ensure that the witness is comfortable testifying while having to be conscious of all of the details involved in testifying effectively. Without rehearsal, it is unlikely that a witness who is unfamiliar with the process of testifying would be able to deal with all of these suggestions and manage to testify effectively. The experience of testifying in court is different than the methods of communication to which most people are accustomed and can be very stressful. Recognition of the stressful nature of testifying in court is not a recent occurrence: "There is no more trying situation or one more calculated to disturb one's ordinary method of thought or to affect one's power of expression, than that of a witness in a court trial (Taft, 1934, p. 61)." The witness should be willing to admit mistakes and should not ignore inconsistencies. In order to prepare the witness for improvements in testimony delivery, trainers can ask the witness questions pertaining to personal style, openness to making changes, personality, and the witness' definitions of believability in order to assess potential problem areas and gauge how willing the witness will be to work on improving testimony (Follingstad, 1984). Involving the witness in identifying problem behaviors increases the likelihood that the witness will make the changes necessary to improve testimony. Relaxation training techniques can assist witnesses in reducing anxiety related to testifying in court.

Involving the witness in role-play can also increase the likelihood that a witness will testify effectively (Nelson, 1999). By simulating the question-answer format of

courtroom examination, a trainer can closely monitor problem behaviors and practice modifying those behaviors with the witness. Participating in role-play of possible trial questions can familiarize the witness with the feelings that can accompany testifying for the first time; this familiarity can help witnesses and trainers deal with potential problems before the actual trial. During the role-play, especially when reviewing the cross-examination, the consultant should not go easy on the witness because the idea is to have the witness be prepared for potentially embarrassing or anger-inciting questions from the actual opposing lawyer (Jacobs, 1998). Cross-examination questions are commonly asked to attack the character of the witness; responses to these questions should affirm the witness' worth and belief about the testimony (Brodsky, 1999). Without preparation, questions designed for this reason can damage a credible witness' testimony. Role-play offers a chance to point out problem behaviors in the moment and it helps increase the confidence of the witness (Kerper, 1998). Kerper also suggests performing reverse role-play in which the witness comes up with potential questions. Reverse role-play illuminates previously uncovered concerns of the witness. Ultimately, nothing that happens in court should come as a surprise to the well-trained witness, and the witness should be able to testify comfortably and honestly without looking trained.

More sophisticated methods of reviewing the witness' initial testimony style include videotaped testimony simulation (Nelson, 1999). In videotaped simulation, a role-play of both direct and cross-examination is completed on videotape. After the taping, the testimony is reviewed with the witness by watching the role-play and stopping the video to suggest changes and improvements that can be made. This process is continued until the witness is prepared. Using videotape, the witness can actually see the

examination and responses to questions (Dombroff, 1985). Videotaping provides concrete examples of problem behaviors to show the witness, which allows the witness to have a better understanding of which behaviors to correct. It also allows witnesses to monitor their improvements and gain confidence as they see themselves improving their testimony delivery skills. Videotaped testimony is useful in preparing criminal defendants because the tapes can be protected as attorney work product, while tapes of eyewitnesses or expert witnesses may be discoverable (Boccaccini, 2002).

Witness Preparation Training and Evaluations from Trained Raters

Early witness preparation studies focused on the impact of witness preparation on confidence and certainty in eyewitness identifications only and provided no specific information about the impact of training on the broad range of communication skills that may be the focus of witness preparation (Spanos, Quigley, Gwynn, Glatt, & Perlini, 1991; Wells, Ferguson, & Lindsay, 1981). Boccaccini, Gordon, and Brodsky (2005) provided a more detailed examination of nonverbal behavior in witness preparation by examining the effects of a broad and multifaceted witness preparation training program on individual behaviors and perceptions of their credibility and guilt. In this study, mock criminal defendants ($N = 55$) provided a detailed description of a minor crime they were accused of but did not commit (e.g. petty theft, traffic violations). Researchers used this description to create detailed direct and cross-examination questions tailored to the mock defendants' actual experiences. Approximately one week later, mock defendants participated in a videotaped testimony session in which they underwent direct- and cross-examination questioning. Following the first taped testimony session, mock defendants either participated in a 40-minute, individually tailored, witness preparation training

session or no training at all (control condition). All defendants then testified a second time, approximately one week after the first testimony session.

Training sessions were tailored to the individual needs of each mock defendant. The defense attorney served as the trainer; both trainers had prior experience with actual witness preparation training. As part of the training, the trainer and mock defendant reviewed and critiqued the taped testimony from the first testimony session, highlighting effective and ineffective portions of testimony. The defendants were informed about behaviors expected from an ideal witness, and they were encouraged to identify effective and problem behaviors and participate in the training. The attorneys then modeled appropriate testimony behavior and led role-plays in which the defendant practiced performing these behaviors. Behaviors focused on in these sessions included posture, gaze while talking and listening, and hand fidgeting, among others. Attorneys and trained defendants reviewed these behaviors at the beginning of the second testimony session as well, prior to the defendant's second testimony session.

Six psychology graduate students were trained to evaluate the use of nonverbal behavior during the testimony sessions. These evaluators also completed ratings of credibility, perceived guilt, and overall testimony quality for each defendant. Results from trained raters' evaluations of the testimony tapes suggested that witnesses who received training improved in the areas of better posture, less fidgeting, increased gaze, better response quality, making fewer guesses, fewer hedges, fewer vocal hesitations, and less facial uncertainty. Additionally, raters noted improvements in the trained defendants in the areas of credibility, testimony quality, and nervousness.

Witness Preparation Training and Evaluations from Untrained Raters

One limitation to the Boccaccini et al. (2005) study findings was that the ratings of witness credibility and testimony quality were made by the same six graduate student evaluators who had coded the testimony tapes for verbal and nonverbal behavior. Although credibility and effectiveness ratings from these raters tended to show a high level of agreement, the findings may have been attributable to having raters attend to certain behaviors or to their relatively high levels of education. Caillouet, Boccaccini, and Fernandez (2005) had undergraduate mock jurors (N = 196) evaluate a representative selection of eight mock defendants from the larger study to obtain a more generalizable estimate of the impact of the witness preparation training program on the defendants' credibility and effectiveness. The eight defendants were selected so that they included an equal number from the training and control groups (4 each), an equal number of male and female defendants from each group, and represented the two most common types of crime accusations made against the defendants (theft or driving infraction). So, there was one male defendant, prepared by the first trainer, accused of theft, one female defendant prepared by the second trainer, accused of theft, and so on, with eight possible combinations of the three tape characteristics.

Mock jurors were randomly assigned to one of four study conditions: Prepared Defendants Testimony 1, Prepared Defendants Testimony 2, Control Defendants Testimony 1, and Control Defendants Testimony 2. Each condition contained four videotaped testimony simulations; mock jurors participating in the study viewed the four videotapes in their assigned condition. The order of tapes within each condition was counterbalanced. This design was used to maximize the time available from jurors

(evaluating 4 defendants required approximately 1 hour), while at the same time allowing for comparisons between the four conditions. Four prepared and four unprepared defendants were used to provide more generalizable findings.

Mock jurors were instructed that the videotapes they were going to view contained simulated testimony from students at another university who sought free legal assistance from the university's law school. Each videotape contained direct- and cross-examination testimony. After each testimony segment (direct examination, cross-examination), mock jurors rated the defendant on testimony quality (*How well did the defendant testify?* 1 very poorly—6 very well), likelihood of guilt, and credibility. They also rated defendants on behavioral variables of composure, ability to understand, and "stiffness."

The following results are reported for the four defendant tapes that will be used in the proposed research study (from male defendants). Overall, training was associated with more positive evaluations of testimony quality. There was a significant interaction between testimony session and training condition, with prepared defendants showing a greater improvement in testimony quality over time than control defendants [$F(1,187) = 5.00, p = .03$, Partial $\eta^2 = .03$]. Prepared defendants were rated as more understandable than control defendants, but they were also rated as more stiff. Prepared defendants showed higher levels of composure than control defendants during cross-examination only. Training was related to changes in ratings for some variables, with some unexpected findings. For example, defendants who were more animated were given lower quality ratings than defendants who were more stiff. It is unclear why training was

related to overall ratings of witness testimony quality, but not necessarily related to better behavioral ratings.

Findings from Trained vs. Untrained Raters

The graduate student raters were trained to pay particular attention to behaviors thought to be associated with effective testimony, and their ratings of nonverbal behaviors were associated with perceptions of effectiveness and credibility. However, the undergraduate raters were not given any instruction about specific behaviors. These naïve raters perceived the prepared defendants to have given more effective testimony than the unprepared defendants, but they did not appear to notice any changes in nonverbal behavior. Verbal and nonverbal displays and symbols, although different in form, interact to communicate information to others (Buck & VanLear, 2002). Research suggests that nonverbal communication is related to raters' impressions of a speaker, while verbal communication is related to recognition of the speaker's message (McMahan, 1976).

A body of social and cognitive psychology research suggests that although people are relatively accurate in perceiving others, they are less capable of recognizing the factors that influenced their perceptions (Nisbett & Wilson, 1977; Smith, Archer, & Costanzo, 1991). Further, judges are often unable to describe accurately which stimuli influenced their judgments (Nisbett & Wilson, 1977). Smith et al. (1991) had undergraduate students rate 60-90 second videotaped scenes showing people involved in various social interaction situations (e.g., two men talking about a recently played basketball game). The rating task required the student judges to choose an answer to one or more questions about outcomes and social relationships based on interpretations of the

video clips (e.g. "Who won the basketball game?"). Accuracy was measured by how often the students gave the correct interpretation of the situations; researchers designed each question to have an objective correct answer. After completing the task, students gave estimates of the perceived accuracy of their interpretations overall. Results suggested that confidence was unrelated to accuracy (r = .08). Some confident judges were not accurate, and some accurate judges were not confident in their decisions. However, in a follow-up study, researchers had undergraduates rate their perceived accuracy following each individual rating task; confidence was related to accuracy (r = .35) when students made confidence ratings about individual judgments rather than providing a global rating.

In the series of witness preparation studies described above, trained raters may have been more influenced by the defendant's behaviors because of their prior knowledge and increased awareness of these important behaviors. Untrained raters may have been influenced by these behaviors as well but were not aware of this influence because they were making more global judgments. Given that jurors in real cases are not trained to carefully rate and consider nonverbal behavior, the findings from mock jurors are troubling for those who wish to streamline witness preparation training procedures because they say little about what did nor did not influence their perceptions. Although it is plausible that these mock jurors were not influenced by the behaviors that were modified through training (according to the trained raters), there has to be some reason why they perceived the prepared defendants to have been more effective. A more likely explanation is that the mock jurors were influenced by the same behaviors as the trained raters, but just did not know that they were influenced by them.

The current study used eye tracking methodology with a new sample of mock jurors to provide information about the behaviors that naïve observers attend to (visually) when watching these same videotapes of simulated courtroom testimony. We then correlated this eye tracking information with jurors' ratings of testimony effectiveness and witness credibility to examine the relation between visual attention to specific behaviors and perceptions of defendant testimony.

Eye Tracking Methods and Research

Eye tracking and pupillometry measures are becoming increasingly popular tools for conducting social science research as the equipment needed to obtain these measures becomes more user-friendly and affordable. In eye tracking research, a camera attached to a headset worn by an observer will provide 60 eye tracking measurements per second, meaning that the researchers will know exactly where an observer is looking every 1/60 of a second. Pupillometry refers to measuring the diameter of the pupil, which provides an estimate of cognitive and emotional processing (see Granholm & Steinhauer, 2004). The main unit of analysis in eye tracking research is a fixation. A fixation occurs when the observer looks at an object or feature for a long enough period of time to be recognized. The main unit of analysis in pupillometry is change in pupil diameter during gaze fixation; this is calculated by averaging pupil measures during a fixation.

Eye tracking measures have recently been used in a series of studies with children diagnosed with Autism Spectrum Disorders to determine if differences in eye movements might be associated with the interpersonal communication deficits that are characteristic of these disorders (Klin, Jones, Schultz, Volkmar, & Cohen, 2002; van der Geest, Kemner, Verbaten, & van Engeland, 2002). Eye tracking research has also been used to

show that normal observers typically look at a speaker's face during interactions and do not pay much attention to gestures and body movements unless they occur away from the body or are looked at by the speaker (Gullberg & Holmqvist, 1999). Eye tracking research has been used to determine whether differences exist between what psychotic and non-pathological participants look at during a neuropsychological test (Huddy et al., 2007) and to show that dysphoric participants gaze longer at photographs depicting negative emotion than control photographs (Caseras, Garner, Bradley, & Mogg, 2007). Pupil size measures have seen some use in impression formation research. For example, pupil dilation has been found to be associated with sexual attraction (see Anderson, Todd-Mancillas, & DiClemente, 1980) and exposure to sex-related sounds (Dabbs, 1997). Although eye tracking research has not advanced to the point where the researcher can make predictions about the influence of specific expressive behaviors on impressions of witness credibility, findings from previous witness preparation research suggest that behaviors related to gaze and fidgeting will influence ratings of testimony effectiveness.

Traditional methods of evaluating the effectiveness of witness preparation training (i.e., subjective ratings) may not provide enough information to identify behaviors most associated with perceptions of testimony credibility. Eye tracking methodology may provide the link between defendant behaviors and their influence on mock juror perceptions of testimony quality. Eye tracking measures provide very precise information about exactly what a person is looking at during a very specific point in time. The primary functions of changes in pupil size are to adjust the amount of light that can enter the eye and improve focus as the distance of an object changes. However,

superimposed on these two primary visual functions is a secondary, involuntary response to a stimulus that is influenced by an individual's cognitive processing activity (Granholm & Steinhauer, 2004). The pupil dilates when information is being processed, as opposed to being ignored (Van Gerven, Paas, Van Merrienboer, & Schmidt, 2004). In addition, the pupil dilates when stimulus information is perceived as pleasant and constricts when stimulus information is perceived as unpleasant (Aboyoun & Dabbs, 1998). These pupil changes occur in response to both visual and auditory stimuli (Dabbs, 1997). In the proposed research, information about pupil diameter will also be provided for every 1/60 of a second. By combining eye tracking and pupillometry measures, it is possible to tell exactly where a mock juror is looking during a specific segment of testimony, whether the juror has devoted cognitive resources to processing some aspect of the testimony, and whether the juror is reacting positively or negatively to that aspect of the testimony. By controlling the type of information available to different groups of mock jurors (e.g., video only, audio only, video+audio), the researcher will be able to use eye tracking and pupillometry measures to identify the expressive behaviors used by defendants that catch jurors' attention and to have a broad measure of how they reacted to the specific expressive behaviors.

Eye tracking and pupillometry have the potential to add to our understanding of the expressive behaviors associated with impressions of witness credibility because the behaviors they measure are relatively free from conscious control. Although people exert some control over where they look, a great deal of eye movement is not consciously controlled. Although eye tracking measures have only recently been used to identify cognitive processing outside of conscious awareness (e.g., Isaacowitz, 2005), the use of

physiological measures to identify this type of cognitive processing has a strong background in social science. For example, Bechara, Damasio, Tranel, and Damasio (1997) used skin conductance measures to show that participants demonstrated a physiological response before making a type of high-risk choice in a game well before they were consciously aware of the high risk that the choice entailed. Other researchers have found increased brain activity in the amygdala in response to briefly flashed faces expressing emotion, even when people are not aware that they have seen the faces (Whalen, Rauch, Etcoff, McInerney, Lee, & Jeinke, 1998).

Purpose of the Current Study

Nonverbal behavior may be as important or even more important than verbal behavior in communicating messages to viewers. Witness preparation training is used to modify witnesses' nonverbal behavior so that they will be persuasive in the courtroom. Trained witnesses are thought to be more effective at communicating their point than witnesses without any training. Previous research indicates that providing training does decrease certain target behaviors and influences the ratings of both trained and untrained jurors (Boccaccini et al., 2005; Caillouet et al., 2005). What remains unclear is the relation between changing specific behaviors commonly focused on in witness preparation training and positive ratings of witness testimony by untrained jurors. Research with trained raters suggests that altering behaviors like fidgeting and gaze is what may lead to improvements in testimony quality (Boccaccini et al., 2005), but the extent to which jurors actually attend to these behaviors when watching testimony is unknown.

Hypotheses

The current study used eye tracking equipment and methodology to provide information about the following research questions and hypotheses:

Hypotheses about Testimony in General

1. The current study was designed to provide the first empirical examination of what mock jurors visually attend to when they watch someone testify. Based on previous eye tracking research (Gullberg & Holmqvist, 1999), I expected that several defendant behaviors unrelated to testimony content (i.e., fidgeting) would capture jurors' visual attention. If these behaviors captured jurors' attention, I expected that they would reduce the overall percentage of the time that they spent looking at the defendants' faces.
2. Defendants who exhibited more "unrelated" nonverbal behaviors (see Hypothesis 1) would be viewed as less credible than defendants who exhibited fewer of these behaviors. Thus, the use of unrelated nonverbal behaviors will be negatively associated with juror ratings of defendant credibility. This hypothesis applies to the total number of fixations upon each specific behavior (e.g., hand fidgeting), as well as the total number of unrelated behaviors.
3. The use of unrelated nonverbal behaviors would be negatively correlated with juror ratings of testimony quality.
4. Use of unrelated defendant behaviors would be associated with lower juror scores on measures of testimony comprehension. Specifically, jurors would understand less information about the factual content of the testimony from defendants who

exhibited more unrelated behaviors than defendants who exhibit fewer unrelated behaviors. This hypothesis applies to the total number of fixations upon each specific behavior (e.g., hand fidgeting), as well as the total number of unrelated behaviors.

5. Jurors would show increased pupil dilation when fixating upon unrelated nonverbal behaviors.
6. Jurors would not be aware of the behaviors that attracted their attention while watching testimony. Jurors' ratings of behaviors that they thought influenced their evaluations of defendant testimony should be negatively related to the proportion of time that the jurors spent looking at unrelated nonverbal behaviors.

Hypotheses about the Effects of Witness Preparation Training

7. For defendants who received witness preparation training, the proportion of time that jurors spent looking at unrelated nonverbal behaviors should be higher for pre-training testimony than post-training testimony. As a result, jurors will have spent more time looking at defendants' faces during post-training testimony than pre-training testimony.
8. For defendants who received no witness preparation training, the proportion of time that jurors spent looking at defendants' unrelated nonverbal behaviors and faces should not change from their first to second testimony simulations.
9. Witness preparation training should be associated with higher juror scores on measures of credibility from Time 1 to Time 2 for trained defendants. Juror scores on measures of credibility should not change from first to second testimony simulations for the control group defendants.

10. Juror ratings of testimony quality should increase from Time 1 to Time 2 for trained defendants, but not control group defendants.
11. Jurors' levels of testimony comprehension should increase from Time 1 to Time 2 for trained defendants, but not control group defendants.

CHAPTER II

METHOD

Participants

Participants (mock jurors) for this research ($N = 100$) were affiliated with SHSU. None of the jurors were aware of the purpose of the study, and any volunteers who had knowledge of the study were excluded from participation. Undergraduate jurors were offered course credit or extra credit for their participation in the study, which took approximately 2.0 hours. In addition, all interested jurors were entered into a drawing to win a 4-gigabyte iPod nano music player, worth approximately $200. In order to be included in the analysis, jurors were required to be jury-eligible. Jury eligibility was broadly defined as anyone over 18 years old who was fluent in English. Jurors were, on average, 24.58 years old ($SD = 6.79$) and primarily female ($n = 73$, 73%). Most jurors identified themselves as White ($n = 64$, 64%), whereas others identified themselves as Black or African American ($n = 13$, 13%), Mexican or Mexican American ($n = 6$, 6%), Other Latina or Latin American ($n = 8$, 8%), Native American/Alaskan Native ($n = 2$, 2%), Multi-ethnic ($n = 6$, 6%), and Other ($n = 1$, 1%).

Videotapes of Simulated Courtroom Testimony

Simulated testimonies from four male mock criminal defendants were used in this study. These videotapes were selected because they have been evaluated by trained raters focusing on coding nonverbal behaviors (Boccaccini et al., 2005) and by mock jurors focusing on overall testimony effectiveness (Caillouet et al., 2005). There were no obvious demographic differences between the defendants; they were all young adult, White, collegiate males. The defendants each testified twice, for approximately 10

minutes total (direct examination and cross-examination), with one week passing between testimony simulations. Two of the defendants received witness preparation training between their first and second testimony sessions, while two did not. Caillouet et al.'s (2005) findings suggested that the prepared defendants were perceived as giving more effective testimony than the unprepared defendants because they received witness preparation. Table 1 provides a summary of the quality of nonverbal behaviors used by these defendants during their testimony, as reported by trained raters from Boccaccini et al. (2005). Gaze and voice quality were expected to increase after training, while all other behaviors were expected to decrease after training.

Table 1

Changes in Behavior Ratings from Time 1 to Time 2

Testimony behavior	Prepared		Control	
	Defendant 1	Defendant 2	Defendant 1	Defendant 2
Poor Posture Time 1	2.32	3.17	2.03	1.55
Poor Posture Time 2	1.42	1.37	1.83	1.63
Fidgeting Time 1	2.57	1.60	1.88	3.12
Fidgeting Time 2	1.07	1.36	2.06	2.62
Gaze Time 1	5.33	5.25	5.38	5.33
Gaze Time 2	5.46	5.67	5.50	5.04
Animated Time 1	3.27	3.12	2.37	2.71
Animated Time 2	2.69	2.27	2.60	2.28
Voice Quality Time 1	5.71	5.17	4.71	4.92
Voice Quality Time 2	5.50	4.96	4.75	4.79
Uncertainty Time 1	2.08	1.39	1.53	1.72
Uncertainty Time 2	1.67	1.50	1.61	1.42
Vocal Pauses Time 1	1.87	1.96	1.54	1.96
Vocal Pauses Time 2	1.46	1.67	1.87	1.96

Note. Each number in this table is a composite rating, each based on several items, with maximum ratings = 6.00, and higher ratings indicating a higher level of the target behavior. Ratings from Boccaccini et al. (2005).

Measures

Witness Evaluator Form

The witness evaluator form was designed to address three types of ratings, judgments of witness credibility, judgments of testimony quality, and comprehension of testimony content (see Appendix A). Jurors completed a witness evaluator form after viewing each testimony tape. The credibility items were rated on six-point scales assessing how closely the defendant matched five credibility characteristics, intelligence, honesty, caring, likeability, and trustworthiness (1 = *not at all,* 6 = *very much*). Credibility researchers suggest that credibility is made up of three primary factors and other secondary factors that vary according to situation variables, rather than viewing credibility as one uniform construct (Gass & Seiter, 2007). Credibility measures are often composed of a number of items based on these credibility dimensions (McCroskey & Young, 1981). Such a measure was not feasible for this study given that the jurors completed witness evaluator forms after viewing each tape, and adding a separate measure to this form would have extended the study time beyond two hours per juror. The previously mentioned five items were chosen to represent the main credibility factors. The testimony quality items assessed the effectiveness of the defendants' testimony delivery in the following areas: sensibility of the explanation (1 = *not at all,* 6 = *very much*), ease of understanding the explanation (1 = *very difficult to understand,* 6 = *very easy to understand*), and overall testimony quality (1 = *not well at all,* 6 = *very well*). Jurors in the video only condition did not answer questions related to sensibility of the explanation and ease of understanding of the explanation because they did not receive

any information about the defendants' explanation of events; therefore, no testimony quality composites were created for jurors in the video only condition.

Table 2 provides internal consistency values, measured by coefficient alpha, for the credibility (N = 100) and testimony quality (N = 69) composites. These composite values are reported for each defendant at each testimony session because the scores used in the study analyses were the ratings averaged across jurors separately for each defendant at each testimony session. As noted in the table, coefficient alpha values ranged from .88 to .93 for the credibility composite and from .83 to .88 for the testimony quality composite, suggesting strong to excellent internal consistency between the items used in each composite. Ratings of overall testimony quality served as a testimony quality indicator for jurors in the video only condition. These ratings were compared with the average Testimony Quality ratings for jurors in the video+audio and audio only conditions.

The testimony content questions were designed to assess the jurors' broad understanding of the defendants' stories. Five separate factual content questions were developed for each defendant (see Appendix C). In general, these questions related to factual details such as information about the type of accusation, location of the alleged incident, accuser, defendants, and alleged accomplices.

Table 2

Internal Consistency Values for Credibility and Testimony Quality

Defendant	Credibility $N = 100$	Testimony Quality $N = 69$
Prepared Defendant 1: Time 1	.92	.83
Prepared Defendant 1: Time 2	.92	.88
Prepared Defendant 2: Time 1	.90	.84[a]
Prepared Defendant 2: Time 2	.89	.85
Control Defendant 1: Time 1	.93[b]	.86[a]
Control Defendant 1: Time 2	.93	.85
Control Defendant 2: Time 1	.92[c]	.86
Control Defendant 2: Time 2	.88	.84

Note. Each number is this table is an internal consistency value, measured by coefficient alpha. [a]$N = 68$. [b]$N = 99$. [c]$N = 98$. N values are smaller for testimony quality because jurors in the video only condition did not rate testimony quality.

Influential Behavior and Demographic Information Form

The influential behavior form was designed to assess which behaviors jurors thought were related to their evaluations of defendant effectiveness (see Appendix B). Jurors completed this form once, after viewing all of the testimony videos. The influential behavior items were rated on six-point scales assessing the level of perceived

influence of the behavior on evaluator ratings of defendant testimony (1 = *not at all,* 6 = *very much*). The following behaviors were assessed: eye contact, fidgeting with feet, fidgeting with hands, facial expression, posture, and changes in posture.

Eye tracking

The eye tracking and pupillometry equipment was purchased from ISCAN. The equipment package (RK-826PCI Pupil/Corneal Reflection Tracking System) includes a headset mounted camera, computer, and software for running the camera and data collection. The camera headset worn by the mock juror is similar to a visor, consisting mostly of a headband. The researcher also added padding to the nosepiece of the headset to decrease the discomfort associated with wearing the plastic headset device. This padding did not obstruct the juror's field of vision. The camera, which sits above one eye, records eye-movement and pupil images through the use of a reflective surface that sits below the eye. Thus, the juror does not actually look through the camera, and the camera and reflective surface do not block the juror's field of vision. The equipment must be calibrated for each juror, a process that takes approximately two minutes. Once calibrated, the camera and software work together to provide a visual image on the computer monitor showing the scene in front of the juror and a small set of cross-hairs (+) showing exactly where the juror is looking, which is referred to as the point of regard (POR). Incorporated in the image is the pupil diameter, vertical and horizontal x-y coordinates for the POR, the frame count (in units of 1/60 second), and the amount of elapsed time. This information is displayed at the bottom of the image that is provided to the researcher. This information is also recorded every $1/60^{th}$ of a second into a dataset that could be saved for each tape viewing.

Several additional pieces of equipment were added to the ISCAN equipment package for this research. First, the image displaying the eye tracking and pupil measurements were recorded, which required connecting a TV/VCR recorder to the computer. Second, the jurors needed to watch the videotaped defendant testimony on an LCD screen, which was connected to the system. A tube-based monitor could not be used because it would produce a horizontal black line (scroll line) that moves vertically through the recorded image. This line would block out portions of the screen and would not allow the researcher to collect eye tracking and pupillometry measures from the recorded image. Third, a microphone needed to be connected to the system so that the recorded image would include sound. Sound information on the recordings was needed to link eye tracking and pupillometry measures with specific spoken statements in the testimony. Finally, an external hard drive was needed to save the data recordings of pupil diameter, vertical and horizontal x-y coordinates for the POR, the frame count, and the amount of elapsed time.

Procedure

All eye tracking and pupillometry data was collected in a windowless laboratory room at Sam Houston State University. The absence of windows allowed for control of the lighting in the room, which was kept at a constant level for all mock jurors. The researcher used a lamp to light the LCD screen and turned off the overhead florescent lights in order to minimize glare. Each juror participated in a single study session. Only one juror was present at each session. After obtaining informed consent from the juror, the researcher fitted the headset-mounted camera to the juror's head. The researcher then

calibrated the camera to the juror's point of regard, which took approximately two minutes. Calibration was updated, as needed, between testimony viewings.

Jurors were randomly assigned to one of the three experimental conditions; video+audio (n = 34), video only (n = 31), and audio only (n = 35). Deconstructing the video footage in this way allowed the researcher to make inferences about the separate influence of verbal and nonverbal behavior on juror ratings of witness credibility and testimony effectiveness. It also allowed for an examination of the extent to which audio information influenced where jurors looked when watching testimony. If an important nonverbal behavior and an important verbal behavior occur simultaneously, using only the combined video+audio tape would not allow the researcher to pinpoint which behavior commanded the juror's attention. On the other hand, using two channels of communication during the same testimony segment, if jurors attend to the nonverbal behavior and not the verbal behavior, then eye tracking and pupillometry data will show attention on the video only and video+audio tape and not the audio only tape.

Each juror evaluated all eight testimony simulation tapes. Each tape contained video footage of one of four mock defendants testifying during both direct and cross-examination. Four of the tapes showed the defendants' first testimony simulations, while the other four showed their second testimony simulations. Counterbalancing was used within each condition to control for the order in which the 8 tapes were organized. Tapes were counterbalanced according to defendant number (1, 2, 3, 4) and testimony time (Time 1, Time 2). First, a random order of defendants was identified (e.g., 4, 1, 3, 2). This order was then repeated, with the final order for the juror being 4, 1, 3, 2, 4, 1, 3, 2. Of the first four tapes, two depicted simulation 1 testimony and two depicted simulation 2

testimony. The opposite simulation tapes were used for the second half of the tape order. So, the final order in the example would be: 4 (Time 1), 1 (Time 2), 3 (Time 2), 2 (Time 1), 4 (Time 2), 1 (Time 1), 3 (Time 1), 2 (Time 2). This procedure ensured that each juror rated 3 defendants before they saw the same defendant for a second time. In addition, each defendant's first session testimony was rated before their second session testimony by approximately half of the jurors. Likewise, each defendant's second testimony session was rated before their first session by approximately half of the jurors.

Before viewing the tapes, the jurors were told that the tapes were made by students at another university who were using that university's free legal services after being accused of a minor crime. This is the same instruction given to mock jurors by Caillouet et al. (2005). After each tape (i.e., at the end of cross-examination), the juror completed ratings of the defendant's credibility and testimony quality. Jurors in the audio only and video+audio condition answered a series of questions about the content of the defendant's testimony; jurors in the video only condition did not answer content questions. After rating all 8 tapes, the juror completed the perceptions of influential expressive behaviors questionnaire and a demographic questionnaire. The researcher then debriefed the juror and gave an opportunity to ask questions. The researcher gave the juror a certificate of participation, a choice of candy, and an opportunity to enter the iPod drawing.

Eye Tracking Measurement

The main unit of analysis in eye tracking research is a fixation. A fixation occurs when the juror looks at an object or feature for a long enough period of time to be recognized. Although there is some variability in estimates of the minimum amount of

time an object needs to be looked at before it is recognized, most researchers accept that a fixation of 100 milliseconds (ms) is sufficient for recognition (see Gullberg & Holmqvist, 1999; van Gog, Paas, & van Merrienboer, 2005).

In the current research, any feature or behavior that was looked at for at least 100ms was identified as fixated. Identifying fixations is a straightforward but time consuming process. Initially, the researcher identified fixations using the data output gathered by the eye tracking software for each video viewing. The data output included 520 datasets (one dataset for each of 8 videos viewed by the 65 jurors from the video only and video+audio conditions). Fixations were identified in the following manner: a gaze was defined as any change of one point or less in the horizontal and/or vertical x-y coordinates for the POR, and a fixation was defined as a gaze that remained constant for at least six frames (6 frames = 100ms). The researcher matched the frame that was identified in the dataset as the start of the fixation with the frame shown on the video output for the coordinating testimony segment in order to identify the location of the POR cross-hairs. For example, if a fixation started at 0 minutes, 21 seconds, and 6 frames, then the researcher matched those numbers with the time and frame output on the video. Then, the researcher watched the recording of the juror's eye movements frame by frame for the duration of the fixation, noting the location of the cross-hairs and the amount of time that had elapsed between eye-movements. Each dataset included tens of thousands of data points, and identifying fixations in this manner turned out to be an excessively time-consuming and labor-intensive method for calculating fixation count data. It took the researcher approximately one hour to identify fixations for one minute of testimony for a single juror. It took approximately four hours to identify fixations for one testimony

session for a single juror, coding for the first two minutes of direct-examination testimony and the first two minutes of cross-examination testimony. A time period of two minutes was chosen to allow the researcher to gather information about fixations within a reasonable time frame for completion of the study. Ultimately, this data recording procedure could not be used for all jurors. It would have taken the researcher 2080 hours to identify fixations for the study, the equivalent of 40 hours of work per week over the course of 52 weeks to identify the number and duration of fixations for all jurors and defendants.

The researcher ultimately identified fixations by watching the recording of the juror's eye movements in slow motion, noting the location of eye-movements lasting six frames or longer. The revised procedure was considerably less time-consuming, taking 2-8 minutes to identify fixations for one minute of testimony, and 8-32 minutes to identify fixations for one testimony session. For each defendant, the researcher counted the number of fixations made by each juror during the first two minutes of each prepared defendant's direct and cross-examination at Time 1 and Time 2. Research suggests that impressions form after very brief exposure, and these impressions are predictive of later decisions (Ambady, Bernieri, & Richeson, 2000).

Coding in this manner took significantly less time to complete; however, identifying fixations in this manner for all jurors and defendants would have taken more than 300 hours to complete. The researcher chose to complete coding for prepared defendants only to ensure that the necessary information could be gathered within a reasonable time frame for completion of the study. Hypothesis 8, therefore, which

suggested that jurors' fixations on unrelated behaviors would not change from Time 1 to Time 2 when evaluating defendants in the control group, was not addressed.

Fixations were separated into four target areas, chosen based on target behaviors identified in Boccaccini et al. (2005; e.g., hand and leg movements, gaze, and changes in posture) and on research suggesting that normal observers typically look at another person's face during interactions (Gullberg & Holmqvist, 1999). The first target area, the head area, was defined as fixations on or near the face. The trunk area was defined as fixations on or near the chest, arms, and hands. Most hand movements occurred in front of the trunk rather than away from the body; therefore, hand movements were not differentiated from the trunk area. Fixations on or near the legs and feet were labeled the feet area, and the fourth area was defined as fixations in the background (not on the body of the defendant). These counts were then aggregated for each defendant and across defendants to identify which areas attracted visual attention and which did not. Coding for fixations in this way, counting the number of fixations in broad areas rather than identifying specific POR locations and measuring the amount of time for each fixation, did not allow for more fine-grained determinations of exact location and duration of fixations (e.g., looking at eyes vs. mouth, hands vs. arms). However, the researcher was able to use fixation data to determine generally what jurors looked at while watching the videotaped testimony.

Pupil Size Measurement

The eye tracking software recorded pupil size measurements at a rate of every $1/60^{th}$ of a second. For each juror, the researcher used the average pupil size for the duration of testimony to compare pupil sizes for each gaze fixation and testimony

segment of interest. For example, if a juror fixated on a hand gesture, the juror's pupil size for each frame throughout that fixation was compared to their overall average pupil size. Pupil size calculations for gaze fixations were only made in experimental conditions in which the juror could actually see the defendant. However, pupil response to specific segments of testimony was made for all jurors. For example, testimony segments of interest in all conditions included those judged by the researcher to be particularly confusing or well stated. Comparisons of pupil measurements between conditions with and without visual information would allow the researcher to make inferences about whether the pupil changes occurred in response to verbal or nonverbal information.

Pupil size and pupil response vary somewhat from person to person. Thus, all pupil size measurements were converted to standardized scores for the purpose of data analysis. Specifically, the eye tracking software reported the average pupil size for each juror. Next, the juror's pupil size for a specific frame of testimony was converted into a Z-score by subtracting the juror's overall average pupil size from the pupil size for a specific frame of testimony. This value was divided by the standard deviation of the overall average pupil size. Transforming these measures into standardized scores allowed for the aggregation of pupil size measurements across jurors. In other words, the calculation removed the effect of natural differences in pupil size that exist between jurors, and allowed each score to be interpreted in terms of how different it is from the juror's overall average pupil size.

Upon reviewing the data, the researcher noted that pupil size did not vary much within individuals. Pupil size did not differ from the overall average by more than one standard deviation unless the juror's eyes were closed. For example, for one juror, pupil

size during one fixation ranged from 0.23 *SD*s above the mean to .38 *SD*s above the mean. During a blink, the juror's pupil size remained at -5.71 *SD*s below the mean; the eye tracking device measured the juror's eyelid as if it were the pupil to determine this value. Pupil size changes when stimuli are perceived pleasant or unpleasant (Aboyoun & Dabbs, 1998), and when exposed to sexual stimuli (Anderson et al., 1980 and Dabbs, 1997). The defendants generally testified about somewhat neutral topics that were not emotionally laden, and they did not discuss any violence or sexually related behaviors. The crimes they were accused of were minor, due to ethical and IRB restrictions on having volunteers discuss more serious offenses for research purposes. It is likely that the defendants' testimonies and behaviors were too neutral to elicit a significant pupil response. The pupil also dilates when information is being processed, as opposed to being ignored (Van Gerven et al., 2004). Given the extreme lack of variability in pupil size during active viewing, this measure was not used for data analysis. Hypothesis 5, therefore, which suggested that jurors would show increased pupil dilation when fixating upon unrelated nonverbal behaviors, was not addressed.

CHAPTER III

RESULTS

For hypotheses related to witness preparation training, I initially analyzed the data using mixed model ANOVAs with defendant (Prepared Defendant 1 and Prepared Defendant 2) as a within-subjects factor. Many of these analyses produced three-way and/or four-way interactions involving the defendant variable, suggesting that study manipulations affected outcomes differently for individual defendants. Because there were no a-priori reasons to expect differences between defendants, the meaning of these complex higher-order interactions is difficult to discern, other than suggesting that findings were different for each defendant. To simplify the presentation of results, I conducted analyses separately for each defendant and present results from these analyses in this section.

Fixation Areas

I used 2 x 2 x 2 x 4 mixed model Analyses of Variance (ANOVAs) to examine the hypotheses that jurors would look away from the defendants' faces when they were engaging in behaviors unrelated to testimony content (e.g., fidgeting; Hypothesis 1) and that jurors would look at unrelated behaviors more often during pre-training testimony than during post-training testimony (Hypothesis 7). Testimony session (Time 1 vs. Time 2), testimony type (direct examination vs. cross-examination), and fixation area (head area, trunk area, feet area, and other area) were the repeated measures variables. Study condition (video+audio vs. video only) was the between subjects factor. Descriptive statistics for raw fixations counts are provided in Table 3. Tables 4 and 5 summarize results from the ANOVA models for each defendant.

Table 3

Number of Fixations in Each Target Area

	Video+Audio (n = 33)				Video Only (n = 31)			
	Pre-Training		Post-Training		Pre-Training		Post-Training	
Defendant	Direct	Cross	Direct	Cross	Direct	Cross	Direct	Cross
One								
Head	40.76 (21.86)	39.73 (23.19)	40.48 (22.53)	39.79 (20.65)	40.68 (23.45)	40.77 (25.57)	38.84 (24.17)	41.52 (28.56)
Trunk	14.82 (11.74)	13.09 (11.64)	16.12 (10.59)	15.79 (13.00)	22.00 (18.44)	16.97 (15.10)	17.97 (12.25)	15.10 (14.21)
Feet	10.58 (8.89)	9.12 (9.89)	6.21 (8.51)	5.73 (9.09)	14.10 (10.67)	10.77 (11.18)	7.26 (8.24)	6.61 (6.63)
Other	7.67 (10.39)	11.33 (14.19)	4.36 (5.50)	11.12 (12.68)	8.52 (12.17)	9.87 (12.40)	6.32 (7.63)	13.06 (15.83)
Two								
Head	38.33 (22.62)	33.42 (19.58)	44.09 (22.59)	44.66 (20.05)	40.39 (22.21)	37.90 (22.98)	39.16 (23.06)	37.16 (23.07)
Trunk	17.76 (12.19)	13.76 (11.30)	15.31 (12.03)	13.28 (12.30)	23.68 (17.74)	17.00 (13.65)	17.81 (16.00)	15.16 (15.09)

Table 3 (cont.)

	Video+Audio (n = 33)				Video Only (n = 31)			
	Pre-Training		Post-Training		Pre-Training		Post-Training	
Defendant	Direct	Cross	Direct	Cross	Direct	Cross	Direct	Cross
Feet	8.30 (5.41)	5.88 (5.15)	4.50 (4.80)	4.06 (5.39)	15.77 (11.83)	8.93 (8.37)	8.84 (10.09)	5.48 (8.05)
Other	6.61 (10.10)	6.54 (9.80)	7.12 (10.69)	11.12 (11.03)	6.35 (7.77)	9.06 (11.74)	9.23 (10.58)	11.45 (11.33)

Note. Video+audio Defendant 2 n = 32.

Count data often fails to meet statistical assumptions of normality and tends to be positively skewed because scores typically cluster near the lower end of the distribution; therefore, I used a square-root transformation for all count variables to account for skew before running the ANOVA models.

Defendant 1

Hypotheses 1 and 7 stated that behaviors unrelated to testimony content (e.g., fidgeting) would capture jurors' visual attention, thus reducing the amount of fixations in the head area. Hypothesis 1 suggested that this pattern would be present in all defendants, and Hypothesis 7 predicted that this effect would be evident in comparisons between pre-training and post-training testimony for prepared defendants. Because I was not able to examine effects for control group defendants as initially planned, Hypotheses 1 and 7 are interchangeable. Because witness preparation training was associated with a reduction in fidgeting for both prepared defendants (Boccaccini et al., 2005) a finding that fixations in the head area were more common at Time 2 (post-training) than Time 1 (pre-training) would be consistent with this hypothesis. This pattern of effects would be indicated by a two-way interaction between testimony session and fixation area.

For Defendant 1, a main effect for fixation area (Partial $\eta^2 = .80$; see Table 4) suggested that jurors made more fixations in the head area overall, followed by the trunk, other, and feet areas. There was also a main effect for testimony session (Partial $\eta^2 = .12$) indicating that jurors made fewer fixations overall when they reviewed post-training testimony. As predicted by Hypotheses 1 and 7, there was a two-way fixation area by testimony session interaction (Partial $\eta^2 = .40$). Jurors' fixations in the head (pre-training: $M = 40.48$, $SD = 2.82$; post-training: $M = 40.16$, $SD = 2.93$), trunk (pre-training: $M =$

16.72, $SD = 1.74$; post-training: $M = 16.24$, $SD = 1.46$), and other (pre-training: $M = 9.35$, $SD = 1.46$; post-training: $M = 8.72$, $SD = 1.20$) areas did not change much after training, but jurors tended to make fewer fixations in the feet area when they watched post-training testimony ($M = 6.45$, $SD = .98$) than pre-training testimony ($M = 11.14$, $SD = 1.20$). This finding provides partial support for Hypotheses 1 and 7, in that there was a reduction in fixations away from the head after training. Fixations in the head area remained stable, but fixations in the feet area declined after training, suggesting that training reduced the extent to which jurors were distracted by the defendants' leg and foot movements.

There was also a significant two-way interaction between fixation area and testimony type (Partial $\eta^2 = .44$). This interaction indicated that jurors tended to fixate most in the head area during both direct ($M = 40.19$, $SD = 2.65$) and cross-examination ($M = 40.45$, $SD = 2.87$), followed by the trunk area (direct examination: $M = 17.72$, $SD = 1.5$; cross-examination: $M = 15.23$, $SD = 1.51$). During direct examination, jurors fixated more on the feet area ($M = 9.54$, $SD = 1.02$) than the "other" area ($M = 6.72$, $SD = .97$), but this pattern was reversed during cross-examination (feet: $M = 8.06$, $SD = 1.04$; other: $M = 11.35$, $SD = 1.62$). This effect was not related to Hypotheses 1 and 7, but suggests that defendants exhibited more unrelated behaviors during direct examination, possibly due to initial nervousness about testifying.

Table 4

Prepared Defendant 1: Summary of ANOVA Results for Fixations

Effect	df	*F*	Partial η^2
Fixation Area (head vs. trunk vs. feet vs. other)	(3, 60)	81.36**	.80
Testimony Type (direct vs. cross-examination)	(1, 62)	.03	.00
Testimony Session (pre-training vs. post-training)	(1, 62)	8.79**	.12
Study Condition (video+audio vs. video only)	(1, 62)	.44	.01
Fixation Area by Testimony Type	(3, 60)	15.96**	.44
Fixation Area by Testimony Session	(3, 60)	13.36**	.40
Fixation Area by Study Condition	(3, 60)	.30	.01
Testimony Type by Testimony Session	(1, 62)	9.29**	.13
Testimony Type by Study Condition	(1, 62)	1.61	.02
Testimony Session by Study Condition	(1, 62)	.59	.01
Area by Type by Session	(3, 60)	1.16	.05
Area by Type by Study Condition	(3, 60)	1.05	.05
Area by Session by Study Condition	(3, 60)	2.36	.11
Type by Session by Study Condition	(1, 62)	.35	.01
Four-way interaction	(3, 60)	.39	.02

Note. $^{**}p < .01$

When evaluating the defendant before he received training, jurors made more fixations overall during direct examination (M = 19.89, SD = 1.30) than during cross-examination (M = 17.20, SD = 1.19; testimony type by testimony session, Partial η^2 = .13); this pattern was not as strong when jurors evaluated post-training testimony (direct examination: M = 18.96, SD = 1.39; cross-examination: M = 18.59, SD = 1.45). This effect was not related to specific hypotheses, but may reflect a decrease in nervousness over repeated testimony sessions, with a related decrease in behaviors that were unrelated to testimony.

Defendant 2

ANOVA results for prepared Defendant 2 were similar to those for Defendant 1 for the main effect of fixation area (Partial η^2 = .84; see Table 5); jurors made more fixations in the head area than in the trunk, feet, and other areas. As predicted by Hypotheses 1 and 7, there was also a fixation area by testimony session interaction (Partial η^2 = .50). Jurors' fixations in the head area (Time 1: M = 38.86, SD = 2.65) and trunk area (Time 1: M = 17.98, SD = 1.68) changed slightly after training, with more fixations in the head area (Time 2: M = 41.27, SD = 2.71) and fewer fixations in the trunk area at Time 2 (M = 15.39, SD = 1.65). At Time 1, jurors made more fixations in the feet area (M = 9.73, SD = .93) than in the other area (M = 7.22, SD = 1.17), but this pattern was reversed after training (feet: M = 5.72, SD = .87; other: M = 9.73, SD = 1.28). These results are consistent with Hypotheses 1 and 7 in that jurors made more fixations in the head area after training than before training. They also made fewer fixations in the trunk and feet area after training. It is unclear why fixations in the other area increased after training.

As with Defendant 1, there was also an interaction between fixation area and testimony type (Partial $\eta^2 = .42$). Jurors made more fixations in the head area during both direct ($M = 40.64$, $SD = 2.64$) and cross-examination ($M = 38.48$, $SD = 2.48$), followed by the trunk area (direct examination: $M = 18.63$, $SD = 1.70$; cross-examination: $M = 14.74$, $SD = 1.55$). Jurors made more fixations in the feet area than the "other" area during direct examination (feet area: $M = 9.38$, $SD = .95$; other area: $M = 7.38$, $SD = 1.11$), but not during cross-examination (feet area: $M = 6.07$, $SD = .77$; other area: $M = 9.57$, $SD = 1.18$). Again, these findings were not related to study hypotheses, but may relate to initial nervousness about testifying.

ANOVA results for Defendant 2 also revealed a statistically significant main effect for testimony type (Partial $\eta^2 = .20$); jurors made more fixations during direct examination than during cross-examination. Significant interaction effects also qualified this main effect. Jurors made more fixations overall during direct examination than during cross-examination, but fixation rates changed from Time 1 to Time 2. When evaluating the defendant prior to training, jurors made more fixations overall during direct examination ($M = 19.76$, $SD = 1.40$) than during cross-examination ($M = 16.64$, $SD = 1.19$; testimony type by testimony session, Partial $\eta^2 = .13$). After training, jurors made fewer fixations during direct examination ($M = 18.26$, $SD = 1.30$) and more fixations during cross-examination ($M = 17.80$, $SD = 1.16$) than they had when they evaluated the defendant before he received training. These effects were not related to study hypotheses, but may reflect more fidgeting during direct testimony due to more initial nervousness. Increased fidgeting during post-training cross-examination was not expected. There was a statistically significant effect for the interaction between study

condition and testimony session (Partial $\eta^2 = .07$). Jurors made more fixations during the first session when they were presented with only video information ($M = 19.89$, $SD = 1.81$; video+audio: $M = 16.51$, $SD = 1.78$) about the defendant. The number of fixations did not differ by study condition after training (video only: $M = 18.04$, $SD = 1.69$; video+audio: $M = 18.02$, $SD = 1.67$). These results were not related to study hypotheses.

Table 5

Prepared Defendant 2: Summary of ANOVA Results for Fixations

Effect	df	*F*	Partial η^2
Fixation Area (head vs. trunk vs. feet vs. other)	(3, 59)	106.28**	.84
Testimony Type (direct vs. cross-examination)	(1, 61)	15.42**	.20
Testimony Session (pre-training vs. post-training)	(1, 61)	1.41	.02
Study Condition (video+audio vs. video only)	(1, 61)	15.17	.02
Fixation Area by Testimony Type	(3, 59)	14.40**	.42
Fixation Area by Testimony Session	(3, 59)	19.42**	.50
Fixation Area by Study Condition	(3, 59)	1.24	.06
Testimony Type by Testimony Session	(1, 61)	9.21**	.13
Testimony Type by Study Condition	(1, 61)	3.29	.05
Testimony Session by Study Condition	(1, 61)	4.34*	.07
Area by Type by Session	(3, 59)	.10	.00
Area by Type by Study Condition	(3, 59)	1.42	.07
Area by Session by Study Condition	(3, 59)	.78	.04
Type by Session by Study Condition	(1, 61)	1.39	.02
Four-way interaction	(3, 59)	1.22	.06

Note. *$p < .05$. **$p < .01$

Relation Between Fixations and Juror Ratings

Credibility

I used Pearson correlations to examine the relation between jurors' attention to specific areas of nonverbal behavior (fixation count for the area) and their perceptions of witness credibility (see Table 6). Hypothesis 2 suggested that an increase in fixations in non-face areas (e.g., in an area of fidgeting) would be associated with lower juror ratings of witness credibility. The findings in Table 6 provided some support for Hypothesis 2, but only for jurors in the video + audio condition. For jurors who both saw and heard the witness, increased fixations in the leg and trunk area tended to be associated with lower ratings of credibility, although these correlations were small in size (r = -.11 to -.27). However, there was also a negative correlation between fixations in the head area and credibility, suggesting that the negative correlations may be a product of jurors who tended to change their fixation location giving lower ratings of credibility.

In the video only condition, fixations in the trunk area were positively correlated with juror ratings of credibility at Time 2, with the correlations between fixations in the trunk area and credibility being large enough to reach statistical significance. The reason for these positive correlations is unclear, but suggests that perceptions of nonverbal behaviors from witnesses may depend on whether those nonverbal behaviors are accompanied by verbal information.

Table 6

Correlations Between Fixation Location and Ratings of Credibility

	Video+Audio ($n = 33$)		Video Only ($n = 31$)	
Defendant/Fixation Area	Credibility Time 1	Credibility Time 2	Credibility Time 1	Credibility Time 2
Prepared Defendant 1				
Head	-.08	-.01	.12	.21
Trunk	-.27	.04	.20	.36*
Feet/Legs	-.06	.03	-.10	.27
Other	-.13	-.11	.14	.25
Prepared Defendant 2 [a]				
Head	-.06	-.28	-.17	.22
Trunk	-.15	-.25	.02	.40*
Feet/Legs	-.14	-.11	.14	.31
Other	-.14	-.31	.15	.36*

Note. [a] Prepared Defendant 2 Time 2 $n = 32$. *$p < .05$.

Testimony Quality

I used Pearson correlations to examine the relation between jurors' attention to specific areas of nonverbal behavior and their perceptions of testimony quality. Hypothesis 3 predicted that an increase in fixations in non-head areas would be associated with low ratings of testimony quality. The Pearson correlations are presented in Table 7. Overall, the correlations partially supported Hypothesis 3, but only for jurors in the video + audio condition. As with ratings of credibility, an increase in fixations in

non-head areas tended to be associated with decreased ratings of testimony quality for witnesses who both saw and heard the defendant. Although few of these correlations were large enough to reach statistical significance, six were in the .30 range, suggesting a small but potentially important relation. Similar to the findings for perceived credibility, increased fixations in the head area were negatively correlated with testimony quality.

For jurors who saw, but did not hear the defendants, correlations between fixations and testimony quality tended to be positive, especially at Time 2 (post-training). One potential explanation for this effect is that witness preparation training teaches witnesses to use hand movements that facilitate communication. Thus, jurors who focused on these communication enhancing nonverbal behaviors may have perceived the defendants as having given better testimony.

Table 7

Correlations Between Fixation Location and Ratings of Testimony Quality

	Video+Audio ($n = 33$)		Video Only ($n = 30$)	
Defendant/Fixation Area	Quality Time 1	Quality Time 2	Quality Time 1	Quality Time 2
Prepared Defendant 1				
Head	-.06	-.12	.15	.17
Trunk	-.32	-.20	.26	.34
Feet	-.06	-.37*	-.01	.16
Other	-.17	-.29	-.06	.25
Prepared Defendant 2 [a]				
Head	-.07	-.30	-.28	.18
Trunk	-.30	-.17	-.06	.31
Feet	-.28	-.16	.03	.32
Other	-.21	-.40*	-.13	.29

Note. [a] Prepared Defendant 2 Time 2 $n = 32$. *$p < .05$.

Testimony Comprehension

I used Pearson correlations to examine the relation between jurors' attention to specific areas of nonverbal behavior and their comprehension of defendant testimony. Hypothesis 4 suggested that increased fidgeting would be related to more fixations in non-head areas, and that this would relate to jurors recalling less factual information about the defendants' testimonies. The Pearson correlations are presented in Table 8. Although none of the correlations were large enough to reach statistical significance,

several correlations fell within -.24 to -.33, which is consistent with Hypothesis 4 in that fixations in non-head areas were related to lower comprehension scores. The finding that fixations in the other area for Defendant 1 at Time 1 were related to improved testimony comprehension scores (r = .26) was unexpected and inconsistent with Hypothesis 4.

Table 8

Correlations Between Fixation Location and Testimony Comprehension

	Video + Audio (n = 33)	
Defendant/Fixation Area	Comprehension Time 1	Comprehension Time 2
Prepared Defendant 1		
Head	-.08	-.11
Trunk	-.11	-.24
Feet	.17	-.15
Other	.26	-.25
Prepared Defendant 2 [a]		
Head	-.13	.04
Trunk	-.33	.16
Feet	-.16	-.08
Other	-.06	-.05

Note. [a] Prepared Defendant 2 Time 2 n = 32. *p < .05.

Relation Between Fidgeting and Juror Ratings

I used 2 x 4 x 2 mixed model ANOVAs to examine whether fixation areas differed for Prepared Defendant 1 and Prepared Defendant 2 at Time 1 and Time 2 (see Table 3 for descriptive statistics). Identifying which defendant had fewer fixations would allow me to determine whether overall fidgeting influenced jurors' perceptions of defendants, and allow me to further test Hypotheses 2, 3, and 4. If fixation areas differed for each defendant, it would allow me to make predictions about which defendant should

be evaluated more favorably by the jurors. The defendant with the most head area fixations and the fewest trunk, feet, or other area fixations should have exhibited less fidgeting than the other defendant. For example, if Defendant 1 had more fixations in the head area at Time 1 and Time 2, compared to Defendant 2, then Defendant 1 should receive higher ratings of credibility (Hypothesis 2) and testimony quality (Hypothesis 3) and higher comprehension ratings (Hypothesis 4) than Defendant 2. Within subjects factors included defendant (Prepared Defendant 1 vs. Prepared Defendant 2) and fixation area (head vs. trunk vs. feet vs. other); study condition (video+audio vs. video only) was the between subjects factor. Table 9 summarizes results from the ANOVA models.

Table 9

Summary of ANOVA Results for Fixations at Time 1 and Time 2

Effect	df	*F*	Partial η^2
Time 1			
Fixation Area (head vs. trunk vs. feet vs. other)	(3, 60)	71.80**	.78
Defendant (1 vs. 2)	(1, 62)	2.79	.04
Study Condition (video+audio vs. video only)	(1, 62)	1.79	.03
Fixation Area by Study Condition	(3, 60)	.84	.04
Fixation Area by Defendant	(3, 60)	2.28	.10
Defendant by Study Condition	(1, 62)	1.87	.03
Three-way interaction	(3, 60)	.67	.03
Time 2			
Fixation Area (head vs. trunk vs. feet vs. other)	(3, 59)	105.52**	.84
Defendant (1 vs. 2)	(1, 61)	.25	.00
Study Condition (video+audio vs. video only)	(1, 61)	.21	.00
Fixation Area by Study Condition	(3, 59)	.79	.04
Fixation Area by Defendant	(3, 59)	1.08	.05
Defendant by Study Condition	(1, 61)	.13	.00
Three-way interaction	(3, 59)	.58	.03

Note. $^{**}p < .01$

There was a significant main effect at both Time 1 and Time 2 for fixation area (Time 1: Partial $\eta^2 = .78$; Time 2: Partial $\eta^2 = .84$). At both time periods, jurors made most fixations in the head area (Time 1: $M = 78.00$, $SD = 5.11$; Time 2: $M = 81.45$, $SD = 5.32$), followed by the trunk area (Time 1: $M = 34.77$, $SD = 3.22$; Time 2: $M = 31.65$). At Time 1, jurors made more fixations in the feet area ($M = 20.86$, $SD = 1.98$) than the other area ($M = 16.49$, $SD = 2.35$). This pattern was reversed at Time 2 (feet area: $M = 12.25$, $SD = 1.73$; other area: $M = 18.49$, $SD = 2.35$). There were no other statistically significant effects. Fixation areas were consistent across defendants, indicating that ratings of credibility, testimony quality, and testimony comprehension should not differ across prepared defendants.

Relation Between Fixations and Jurors' Perceptions

I used Pearson correlations to examine the relation between jurors' perceptions of the expressive behaviors that influenced their perceptions of the defendants' testimony and their eye tracking results (fixation counts; see Table 10). Hypothesis 6 predicted that jurors' would be unaware of which behaviors influenced their ratings of defendant testimony. Recall that jurors completed these ratings one time, after they had watched all testimony segments, so the correlations examine the relation between jurors' ratings and their fixations across all testimony sessions.

Table 10

Correlations Between Fixation Locations and Jurors' Perceptions of the Influence that Behaviors had on Their Evaluations of Defendants

	Influence of Defendant Behaviors as Rated by Jurors ($N = 64$)					
Fixation Location	Eye Contact	Fidgeting with Feet	Fidgeting with Hands	Facial Expression	Posture	Posture Shifts
Fixations across prepared defendants						
Head Area	-.02	.03	-.05	.11	.11	-.01
Trunk Area	.02	.29*	.21	.22	.20	.24
Feet Area	.01	.25*	.18	.24	.21	.32**
Other Area	-.33**	.18	.02	.13	.09	.11

Note. * $p < .05$. ** $p < .01$. Jurors rated items on a scale of 1 to 6 based on how much they thought each item influenced their evaluations of defendant testimony.

Overall, the findings in Table 10 show that there were modest positive correlations between jurors' ratings that fidgeting with feet and hands were influential and their fixations in the trunk and feet areas (i.e., non-head areas). These findings suggest that, to some extent, jurors tended to report being influenced by behaviors that did indeed capture their attention. These results do not support Hypothesis 6, which predicted that juror ratings of influence would be unrelated or negatively related to fixations in non-head areas.

Effects of Training on Ratings of Credibility

Table 11 presents descriptive statistics for ratings of credibility for each defendant across study conditions.

Table 11

Descriptive Statistics for Credibility Ratings

	Video+Audio (n = 34)		Video Only (n = 31)		Audio Only (n = 34)		Total Rating (N = 99)	
Defendant	Prepared	Control	Prepared	Control	Prepared	Control	Prepared	Control
One								
First Testimony	19.47 (4.74)	17.15 (5.15)	18.61 (4.21)	17.16 (4.35)	20.47 (4.82)	17.68 (5.15)	19.54 (4.62)	17.33 (4.87)
Second Testimony	22.32 (3.82)	17.71 (5.20)	19.71 (4.53)	17.77 (5.12)	22.91 (4.30)	17.26 (5.28)	21.71 (4.40)	17.58 (5.16)
Two								
First Testimony	17.73 (4.36)	15.88 (4.24)	15.64 (4.77)	15.39 (4.80)	17.88 (4.68)	17.03 (5.10)	17.13 (4.67)	16.12 (4.73)
Second Testimony	18.76 (3.96)	16.29 (4.34)	18.45 (4.51)	14.71 (3.93)	17.55 (4.27)	16.76 (4.49)	18.25 (4.24)	15.96 (4.32)

Note. Credibility Composites were composed of five items rated on a scale from 1 to 6. *Minimum rating* = 6. *Maximum rating* = 30.

Hypothesis 9 predicted that witness preparation training should be associated with an improvement in credibility for prepared defendants (e.g., higher credibility at Time 2 than Time 1), but not control group defendants.

I used 2 x 3 mixed model ANOVAs to examine differences in juror ratings of credibility for each defendant. Testimony Session (Time 1 vs. Time 2) was the within subjects factor, and study condition (video+audio vs. video only vs. audio only) was the between subjects factor. Jurors completed credibility ratings after viewing both direct and cross-examination, so no comparisons were made for testimony type. Table 12 presents a summary of ANOVA results. The findings in Tables 11 and 12 are consistent with Hypothesis 9. Both prepared defendants were seen as more credible after training (Time 2) than before training (Time 1; Prepared Defendant 1: Partial $\eta^2 = .19$; Prepared Defendant 2: Partial $\eta^2 = .06$). There was no change in perceived credibility for either of the control group defendants (Control Defendant 1: Partial $\eta^2 = .00$; Control Defendant 2: Partial $\eta^2 = .00$). There were no two-way interactions between testimony session and study condition, indicating that these effects for credibility did not depend on whether jurors based their ratings on only video, only audio, or the combination of video and audio

For one prepared defendant, credibility ratings differed depending on study condition (Prepared Defendant 1: Partial $\eta^2 = .07$). Jurors rated the defendant as more credible when they received video+audio information and just video information, compared to just audio information. This finding suggests that changes in nonverbal behavior (i.e., behavior seen on the video image) influenced jurors' ratings of credibility for this defendant.

Table 12

Summary of ANOVA Results for Training and Credibility

Effect	df	*F*	Partial η^2
Prepared Defendant 1			
Testimony Session	(1, 97)	22.61**	.19
Testimony Session by Study Condition	(1, 97)	1.35	.03
Study Condition	(2, 97)	3.63*	.07
Prepared Defendant 2			
Testimony Session	(1, 97)	5.91*	.06
Testimony Session by Study Condition	(1, 97)	3.01	.06
Study Condition	(2, 97)	23.56	.02
Control Defendant 1			
Testimony Session	(1, 96)	.26	.00
Testimony Session by Study Condition	(1, 96)	.45	.01
Study Condition	(2, 96)	.001	.00
Control Defendant 2			
Testimony Session	(1, 97)	.08	.00
Testimony Session by Study Condition	(2, 97)	.54	.01
Study Condition	(2, 97)	1.80	.04

Note. $*p < .05$. $**p < .01$

Effects of Training on Ratings of Testimony Quality

Table 13 presents descriptive statistics for ratings of testimony quality for each defendant across study conditions. Hypothesis 10 predicted that witness preparation training should be associated with an improvement in testimony quality ratings for prepared defendants (e.g., higher at Time 2 than Time 1), but not control group defendants.

Table 13

Descriptive Statistics for Ratings of Testimony Quality

	Video+Audio (n = 34)		Video Only (n = 30)		Audio Only (n = 34)		Total Rating (N = 98)	
Defendant	Prepared	Control	Prepared	Control	Prepared	Control	Prepared	Control
One								
First Testimony	4.39 (0.97)	3.93 (1.15)	3.70 (1.09)	3.63 (1.16)	4.41 (1.05)	3.77 (1.30)	4.19 (1.07)	3.79 (1.20)
Second Testimony	5.03 (0.83)	3.85 (1.15)	4.13 (1.25)	3.70 (1.21)	5.09 (0.88)	3.71 (1.28)	4.77 (1.07)	3.75 (1.20)
Two								
First Testimony	3.99 (0.87)	3.83 (1.07)	3.13 (1.20)	3.13 (1.07)	4.03 (1.06)	4.01 (1.15)	3.74 (1.11)	3.68 (1.15)
Second Testimony	4.16 (0.93)	4.10 (1.04)	3.83 (1.21)	2.87 (0.94)	4.10 (1.18)	3.98 (0.91)	4.04 (1.11)	3.68 (1.10)

Note. Testimony Quality Composites were composed of three items rated on a scale from 1 to 6. Total scores were averaged to allow for comparisons between all study conditions.

I used 2 x 3 mixed model ANOVAs to examine differences in juror ratings of testimony quality for each defendant. Testimony session (Time 1 vs. Time 2) was the within subjects factor, and study condition (video+audio vs. video only vs. audio only) was the between subjects factor. Table 14 presents a summary of ANOVA results. The findings in Tables 13 and 14 show that both prepared defendants were perceived as having higher quality testimony after training (Prepared Defendant 1: Partial $\eta^2 = .21$; Prepared Defendant 2: Partial $\eta^2 = .06$), but that there was no change in perceived testimony quality for control group defendants (Control Defendant 1: Partial $\eta^2 = .00$; Control Defendant 2: Partial $\eta^2 = .00$). These findings are consistent with Hypothesis 10; testimony quality ratings were higher for prepared defendants after they received training but did not change for control defendants. For one trained defendant and one control defendant, jurors in the video only condition rated defendants as lower in quality than jurors in other conditions, suggesting that verbal communication influenced testimony quality ratings for those defendants.

Table 14

Summary of ANOVA Results for Training and Testimony Quality

Effect	df	*F*	Partial η^2
Prepared Defendant 1			
Testimony Session	(1, 96)	25.03**	.21
Testimony Session by Study Condition	(1, 96)	.38	.01
Study Condition	(2, 96)	9.81	.17
Prepared Defendant 2			
Testimony Session	(1, 96)	6.43*	.06
Testimony Session by Study Condition	(1, 96)	2.18	.04
Study Condition	(2, 96)	6.97*	.09
Control Defendant 1			
Testimony Session	(1, 95)	.05	.00
Testimony Session by Study Condition	(2, 95)	.14	.00
Study Condition	(2, 95)	.39	.01
Control Defendant 2			
Testimony Session	(1, 96)	.00	.00
Testimony Session by Study Condition	(2, 96)	2.44	.05
Study Condition	(2, 96)	19.82**	.20

Note. $*p < .05$. $**p < .01$

Effects of Training on Testimony Comprehension

Table 15 presents descriptive statistics for testimony comprehension scores for each defendant across study conditions. Hypothesis 11 predicted that that witness preparation training should be associated with an increase in juror comprehension of testimony for prepared defendants (e.g., higher at Time 2 than Time 1), but not control group defendants.

Table 15

Descriptive Statistics for Testimony Comprehension

	Video+Audio (n = 34)		Audio Only (n = 35)		Total Rating (N = 69)	
Defendant	Prepared	Control	Prepared	Control	Prepared	Control
One						
First Testimony	3.85 (1.02)	4.62 (0.60)	4.14 (0.84)	4.57 (0.70)	4.00 (0.94)	4.59 (0.65)
Second Testimony	4.29 (0.76)	4.71 (0.58)	4.11 (1.05)	4.60 (0.60)	4.20 (0.92)	4.65 (0.59)
Two						
First Testimony	4.29 (0.90)	4.50 (0.93)	4.11 (1.21)	4.12 (1.00)	4.20 (1.06)	4.32 (0.98)
Second Testimony	3.82 (1.40)	4.53 (0.86)	3.80 (1.23)	4.49 (0.95)	3.81 (1.31)	4.51 (0.90)

Note. Testimony Comprehension was calculated by adding the number of correct responses to 5 testimony comprehension questions.

I used 2 x 3 mixed model ANOVAs to examine differences in juror ratings of credibility for each defendant. Testimony session (Time 1 vs. Time 2) was the within subjects factor, and study condition (video+audio vs. video only vs. audio only) was the between subjects factor. Table 16 presents a summary of ANOVA results. For most defendants, jurors answered content questions correctly at both Time 1 and Time 2. For one prepared defendant, jurors answered fewer content questions correctly at Time 2, although this effect was small (Partial $\eta^2 = .07$). These results did not support Hypothesis 11 because most testimony comprehension scores did not change, and the one significant effect was not in the hypothesized direction. One possible explanation for this result is that the defendant stated one fact loudly during Time 1, and he stated the same fact quietly at Time 2. Jurors may not have heard the exact information in that statement if they viewed the Time 2 video before viewing the Time 1 video.

Table 16

Summary of ANOVA Results for Training and Testimony Comprehension

Effect	df	*F*	Partial η^2
Prepared Defendant 1			
Testimony Session	(1, 67)	2.61	.04
Testimony Session by Study Condition	(1, 67)	3.38	.05
Study Condition	(1, 67)	.09	.00
Prepared Defendant 2			
Testimony Session	(1, 67)	5.16*	.07
Testimony Session by Study Condition	(1, 67)	.20	.00
Study Condition	(1, 67)	.19	.00
Control Defendant 1			
Testimony Session	(1, 67)	.53	.01
Testimony Session by Study Condition	(1, 67)	.14	.00
Study Condition	(1, 67)	.36	.00
Control Defendant 2			
Testimony Session	(1, 67)	2.14	.03
Testimony Session by Study Condition	(1, 67)	1.52	.02
Study Condition	(1, 67)	1.15	.02

Note. $*p < .05$. $**p < .01$

CHAPTER IV

DISCUSSION

I had planned to collect fixation information by using the eye tracking equipment to identify both the exact location and duration of each fixation and to gather these measurements for both prepared and control group defendants. I also intended to use pupil size measurements to compare changes in pupil size within each subject during fixations and across subjects. I altered the study design because it was not possible to complete the study using the planned data collection procedures and because there was a lack of variability in pupil measurements. I ultimately coded fixations by counting how many times a juror gazed in a target area (i.e., head, trunk, feet, other) for 6 frames or longer. Although this is a limitation of the study, I was able to gather information about fixations more generally in order to determine whether fixations in non-head areas (i.e., areas where fidgeting occurred) influenced juror evaluations of defendant testimony. I also focused on testimony from defendants who underwent witness preparation training because focusing on this group allowed me to examine the majority of the study's hypotheses. Despite these limitations related to changes in study design, the study did provide useful information about what potential jurors look at when watching testimony and how witness preparation training may influence what captures their visual attention.

Fixations and Witness Preparation Training

As expected, jurors were more likely to fixate on defendants' non-head/face areas before training compared to after training. For one defendant, jurors were less likely to look at the defendant's legs after training. For the second defendant, jurors were less likely to look at the trunk and more likely to look at the head area. Recall that arm and

hand fixations were included in the trunk category because they could not be differentiated from fixations on the trunk (hands and arms were often in front of the trunk). These findings suggest that witness preparation may be an effective mechanism for reducing the likelihood that jurors will notice fidgeting behavior (e.g., with feet, legs, or hands) and that it may increase the frequency with which they look at the defendant's face.

Additional support for witness preparation training comes from the findings that defendants were perceived as more credible and as having given better testimony after training than before training. Although testimony comprehension was similar for pre- and post-training testimony, the credibility and testimony quality findings are consistent with prior witness preparation research (Boccaccini et al., 2003).

Correlations between fixations in non-head areas, credibility, testimony quality, and testimony comprehension were small, but generally consistent with study hypotheses. Fixations in some non-head areas were related to lower juror ratings of testimony quality when jurors were given both video and audio testimony information. For jurors who saw, but did not hear the defendants, fixations in non-head areas were related to higher ratings of defendant credibility and testimony quality. One possible explanation for these positive correlations is that jurors' interpretations of arm and feet movements differ when jurors receive only nonverbal information rather than verbal and nonverbal information. For instance, jurors may view hand movements as informative in the absence of verbal testimony, and evaluate the defendant as more credible. However, when given both audio and video information, jurors may be distracted from focusing on verbal information by the hand movements and reduce ratings of testimony quality. Because the

positive correlations were somewhat larger for post-training testimony than pre-testimony training, another potential explanation is that jurors were paying attention to nonverbal behaviors encouraged by training (e.g., hand movements to facilitate explanations).

There were no statistically significant correlations between fixation areas and testimony comprehension, but the overall pattern of negative correlations indicated that fixations in non-head areas tended to be associated with lower testimony comprehension scores. For one defendant, this was observed for pre-training testimony. For the other defendant, this effect was found for post-training testimony. The correlations between fixations and testimony comprehension were in the r = -.24 to -.33 range, indicating small effects. Nevertheless, these effects suggest that distracting nonverbal behaviors that catch jurors' attention may distract them from paying attention to the content of witnesses' testimony.

Fixation Areas

Overall, jurors tended to make more fixations in the head area than in any other fixation area. This pattern occurred across testimony sessions and across defendants. This is consistent with research suggesting that observers typically look at a speaker's face during interactions (Gullberg & Holmqvist, 1999) rather than body movements. Jurors made more fixations in the trunk area than in the feet and other areas. Many of the hand and feet movements occurred close to the defendants' bodies, and likely did not attract jurors' visual attention as much as movements that occur away from the body. Also, jurors tended to make more fixations in non-head areas during direct examination, indicating that initial nervousness about testifying may relate to increased fidgeting. This

pattern may also be related to jurors looking in non-face areas when they first begin viewing testimony before settling on the head area.

Juror Beliefs about the Influence of Nonverbal Behaviors

Jurors were inconsistent in identifying which testimony behaviors were associated with their credibility and testimony quality ratings of defendants. They were correct in attributing fidgeting in the hand and feet to fixations in the trunk and feet area; however, these effects were modest (r = .18 to .29). These results were inconsistent with the hypothesis that jurors would be unaware of which behaviors influenced their evaluations of defendants.

Eye Tracking and Trained and Untrained Raters

Witness preparation training is a costly and time-consuming process designed to alter verbal and nonverbal behaviors in order to enhance a witness' effectiveness at delivering testimony in the courtroom. Little is known about exactly which nonverbal behaviors are most related to improving witness testimony. Trained graduate students (Boccaccini et al., 2005) and untrained undergraduate mock jurors (Caillouet et al., 2005) both made higher ratings of defendant credibility and testimony quality after they received witness preparation training; however, the two groups differed in their recognition of the effects of nonverbal behaviors on their defendant ratings. The current study attempted to link the results of Boccaccini et al. (2005) and Caillouet et al. (2005) by using eye tracking methodology to identify the nonverbal behaviors that captured mock jurors' visual attention when evaluating testimony. As with the previous two studies, mock jurors generally made higher ratings of witness credibility and testimony quality for trained defendants after they received training, while ratings for control

defendants were unchanged. This finding provides further support for the effectiveness of witness preparation training in improving testimony delivery.

Examination of fixations indicated that jurors typically fixated in the head area, followed by the trunk area, then the feet and other areas. I hypothesized that unrelated behaviors (i.e., fidgeting) would capture jurors' attention, but was not able to provide a direct test of this hypothesis. Future eye tracking studies could examine this issue by studying whether jurors fixate on pre-identified nonverbal behaviors, such as a specific five-second episode of fidgeting or a specific posture shift. Fidgeting, indirectly defined by fixation location in the body/trunk area, was somewhat related to ratings of credibility and testimony quality; however, these effects differed depending on whether jurors received both verbal and nonverbal testimony information. Jurors were somewhat accurate in rating which behaviors influenced their evaluation of defendant testimony.

Limitations

One significant limitation of this study was that it was not possible to collect sufficient data for examining all of the original study hypotheses. In this study, I identified fixations based on four general fixation areas and used counts of fixations rather than identifying specific fixation locations and coding the specific amount of time per fixation. More specific identification of fixation locations would have allowed me to identify when jurors were fixating on feet while the defendant was moving his feet or hands while the defendant was using adaptors. Recording the exact duration of each fixation would have allowed me to examine whether the overall amount of time fixating on one location may be a more important predictor of juror impressions that the number of fixations. For example, a juror who tended to fixate on the head area for long periods

of time area may have had relatively few fixations in the head area. In the current study, this juror would be categorized as someone who looked less at the head area than other jurors, who may have looked at the head area for only brief periods of time.

In addition, I was not able to compare fixations for trained and untrained defendants. I was able to address hypotheses related to witness preparation training by comparing findings from pre-training to post-training testimony, including testimony from control group defendants (untrained defendants) would have allowed me to examine whether changes over time were attributable to the witness preparation training or to simply testifying for a second time (e.g., experience of testifying).

Another study limitation related to pupil size measurement; pupil size did not vary much for participants in the study. One possibility for this lack of variability is that the information provided in the defendant testimony was not powerful enough to elicit a clear pattern of pupil response. Previous research has suggested that pupil response to aggressive stimuli did not differ from control responses, although pupil size did change when participants were exposed to sexual stimuli (Dabbs, 1997). The aggressive stimulus in that study was a video of a couple arguing about infidelity. Given that the testimony in this study was likely lower in emotional content than an aggressive argument, it is not surprising that pupil size did not vary noticeably among jurors. None of the defendants described any violent or sexual acts in their testimonies.

Another limitation of the study includes the limitations of the eye tracking equipment for jury research. Even if I was able to account for head movements, the eye tracking device only provides information about direct gaze. Even if jurors fixated on the defendant's face during testimony, hand and feet movements may still have registered in

their peripheral vision. It would not have been possible to account for distractions that did not result in changes in gaze with the current eye tracking technology. Also, wearing the head-mounted camera was somewhat uncomfortable for jurors, and this discomfort may have registered in their pupil size measurements.

Several study design limitations also may have influenced study findings. First, the videotapes were created using undergraduate research volunteers who were not testifying about serious criminal acts. Further, each videotaped case only included testimony from the defendant, not multiple witnesses. These videotapes may not be representative of what actual jurors will evaluate when watching a criminal trial. Also, the participant pool for the study was not representative of potential jury members. Participants were more educated and younger on average than typical jurors in east Texas. The extent to which representativeness may have influenced eye fixations is unclear. Finally, jurors evaluated testimony individually, in one two-hour session, in a laboratory room, and under controlled conditions. This does not represent the typical manner in which actual jury members evaluate a defendant's testimony.

Conclusions

Findings from the current study provided some support for witness preparation training by showing that jurors are less likely to fixate on non-head areas of prepared witnesses and that fixations in non-head areas are moderately associated with perceived credibility and testimony quality. Fixations in non-head areas were differentially related to credibility and testimony quality ratings based on study condition. Specific information about the effect of reducing fidgeting on improving juror ratings is difficult to interpret

given the differences in findings for each defendant; however, there is some support that reducing fidgeting increased defendants' testimony delivery.

Future research should focus on obtaining more specific data about fixation location and duration in order to obtain a more detailed analysis of behaviors that capture jurors' attention. Researchers can obtain this information either by purchasing additional eye tracking equipment to calculate head location or by requiring jurors to remain still throughout the testimony evaluation. Using this type of equipment would allow the researcher to digest and analyze the data more efficiently. Future research might also include creating "extreme" prototype videos, one with excessive hand fidgeting, one with excessive feet fidgeting, and one with no fidgeting to determine whether these behaviors capture jurors' attention at all.

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APPENDIX A

Evaluator Rating Form

_____ Video Number (2, 6)
_____ Date

Please rate the witness on the following dimensions based on what you saw or heard on the video.

	Not at all ..... Very much					
1) How intelligent was the defendant?	1	2	3	4	5	6
2) How honest was the defendant?	1	2	3	4	5	6
3) How caring was the defendant?	1	2	3	4	5	6
4) How likeable was the defendant?	1	2	3	4	5	6
5) How trustworthy was the defendant?	1	2	3	4	5	6
6) How sensible was the defendant's explanation of what happened?	1	2	3	4	5	6
7) How easy was it to understand the defendant's testimony?	Very difficult to understand ..... Very easy to understand 1	2	3	4	5	6
8) Overall, how well did this defendant testify?	Not well at all ..... Very well 1	2	3	4	5	6

Please answer the following questions based on what you saw or heard on the video.

1) What time was it when the defendant was accused of the crime?

2) Where was the defendant pulled over?

3) What is PT class?

4) What do police cars on campus look like?

5) Briefly, what is the defendant's version of what happened?

Please answer the following question based on what you saw or heard on the video.

What do you think most influenced your evaluation of the defendant?

Evaluator Rating Form

_____ Video Number (4, 8)
_____ Date

Please rate the witness on the following dimensions based on what you saw or heard on the video.

	Not at all ..... Very much					
1) How intelligent was the defendant?	1	2	3	4	5	6
2) How honest was the defendant?	1	2	3	4	5	6
3) How caring was the defendant?	1	2	3	4	5	6
4) How likeable was the defendant?	1	2	3	4	5	6
5) How trustworthy was the defendant?	1	2	3	4	5	6
6) How sensible was the defendant's explanation of what happened?	1	2	3	4	5	6
	Very difficult to understand ..... Very easy to understand					
7) How easy was it to understand the defendant's testimony?	1	2	3	4	5	6
8) Overall, how well did this defendant testify?	Not well at all ..... Very well					
	1	2	3	4	5	6

Please answer the following questions based on what you saw or heard on the video.

1) What is the name of the bar where this incident took place?

2) What was the reason for the defendant to leave the bar?

3) How was Andy Jones carrying the bottle of vodka?

4) What did Mr. Smith do when he spoke with the doorman?

5) Briefly, what is the defendant's version of what happened?

Please answer the following question based on what you saw or heard on the video.

What do you think most influenced your evaluation of the defendant?

Evaluator Rating Form

_____ Video Number (11, 15)
_____ Date

Please rate the witness on the following dimensions based on what you saw or heard on the video.

	Not at all ..... Very much					
1) How intelligent was the defendant?	1	2	3	4	5	6
2) How honest was the defendant?	1	2	3	4	5	6
3) How caring was the defendant?	1	2	3	4	5	6
4) How likeable was the defendant?	1	2	3	4	5	6
5) How trustworthy was the defendant?	1	2	3	4	5	6
6) How sensible was the defendant's explanation of what happened?	1	2	3	4	5	6
7) How easy was it to understand the defendant's testimony?	Very difficult to understand ..... Very easy to understand 1	2	3	4	5	6
8) Overall, how well did this defendant testify?	Not well at all ..... Very well 1	2	3	4	5	6

Please answer the following questions based on what you saw or heard on the video.

1) What is the name of the department store where the incident took place?

2) What was the defendant doing while in the store?

3) Who was the witness to the alleged offense?

4) Why did Mr. Smith refuse to cooperate with the manager?

5) Briefly, what is the defendant's version of what happened?

Please answer the following question based on what you saw or heard on the video.

What do you think most influenced your evaluation of the defendant?

Evaluator Rating Form

_____ Video Number (12, 16)
_____ Date

Please rate the witness on the following dimensions based on what you saw or heard on the video.

	Not at all ..... Very much					
1) How intelligent was the defendant?	1	2	3	4	5	6
2) How honest was the defendant?	1	2	3	4	5	6
3) How caring was the defendant?	1	2	3	4	5	6
4) How likeable was the defendant?	1	2	3	4	5	6
5) How trustworthy was the defendant?	1	2	3	4	5	6
6) How sensible was the defendant's explanation of what happened?	1	2	3	4	5	6
7) How easy was it to understand the defendant's testimony?	Very difficult to understand ..... Very easy to understand 1	2	3	4	5	6
8) Overall, how well did this defendant testify?	Not well at all ..... Very well 1	2	3	4	5	6

Please answer the following questions based on what you saw or heard on the video.

1) Why did the defendant look out of the kitchen window?

2) What was damaged?

3) What type of car does the defendant drive?

4) What did the defendant see when he drove down the road?

5) Briefly, what is the defendant's version of what happened?

Please answer the following question based on what you saw or heard on the video.

What do you think most influenced your evaluation of the defendant?

APPENDIX B

Demographic Questionnaire

Please answer the following questions about yourself.

1. How old are you? _____ years

2. What is your gender? _____ female _____ male

3. Tell us what you consider yourself.

___ White (Caucasian/ European or European American)
___ Mexican or Mexican American
___ Other Latina or Latin American
___ Black or African American
___ Caribbean Islander
___ Asian or Pacific Islander
___ Native American/ Alaskan Native
___ Multi-ethnic
___ Other

Please rate the following behaviors based on how much they influenced your evaluations of witnesses.

	Not at all ..... Very much					
1) Eye Contact	1	2	3	4	5	6
2) Fidgeting with feet	1	2	3	4	5	6
3) Fidgeting with hands	1	2	3	4	5	6
4) Facial Expression	1	2	3	4	5	6
5) Posture	1	2	3	4	5	6
6) Changes in Posture	1	2	3	4	5	6

APPENDIX C

Correct Answers to Evaluator Rating Form Questions

Sometimes people will put multiple answers and one will be correct but the other is incorrect. Give them credit because part of it is correct.

For the 5th questions, as long as they have some element of the defendant's story, it's okay…even if they get some things wrong. It's wrong though if they say the defendant is guilty.

Tapes 2 & 6:

1) What time was it when the defendant was accused of the crime?
    a. 5:50AM (not PM)
    b. 5:50
    c. no other times are okay (not 5:45, not 6)

2) Where was the defendant pulled over?
    a. Approximately a quarter of a mile from the intersection
    b. Short distance past intersection
    c. Campus Drive/Rd/Ave/etc. (not just on campus)

3) What is PT class?
    a. Physical Training class
    b. Must include physical training (not personal training, not just ROTC class)

4) What do police cars on campus look like?
    a. Have to have at least two correct features:
        1) Grey
        2) POLICE written on the side
        3) Red and blue lights on top
        4) Reflectors
        5) Light sticking out of driver's side window
        6) Looks like a state troopers car

5) Briefly, what is the defendant's version of what happened?
    a. Any iteration of he stopped at an intersection and was pulled over after driving through the intersection because a police car was stopped in the intersection.

Tapes 4 & 8

1) What is the name of the bar where this incident took place?
    a. Good Times bar
    b. Has to include Good Times

2) What was the reason for the defendant to leave the bar?
    a. They called last call.
    b. The bar was closing.
    c. Not: Andy was drunk, they were drunk, he was underage

3) How was Andy Jones carrying the bottle of vodka?
    a. Above his head.
    b. Over his head.
    c. Not: on his head, in his hand (although in his hands above his head is okay)

4) What did Mr. Smith do when he spoke with the doorman?
    a. Put his beer down.
    b. Anything that suggests he got rid of his beer.
    c. Not: pushed Andy out (again, unless it also includes putting his beer down); talked to doorman

5) Briefly, what is the defendant's version of what happened?
    a. Any iteration of his friend stole the vodka and he didn't have anything to do with it.

Tapes 11 & 15

1) What is the name of the department store where the incident took place?
    a. Ames Department store (any spelling of this is fine as long as you can tell it has Ames)
    b. Ames

2) What was the defendant doing while in the store?
    a. Walked around first then played video games.
    b. Playing video games.
    c. Must include play in the answer for it to be correct (not looking at video games)

3) Who was the witness to the alleged offense?
    a. A store employee. (any version of employee—clerk, worker, etc)
    b. Not store manager

4) Why did Mr. Smith refuse to cooperate with the manager?
    a. Because he was being wrongly accused.
    b. Because he was not in a great mood.
    c. Because he didn't do anything.

5) Briefly, what is the defendant's version of what happened?
    a. Any iteration of his friend stole things from the store without his knowledge; he was just playing video games and didn't have any idea.

Tapes 12 & 16

1) Why did the defendant look out of the kitchen window?
    a. He heard a noise.
    b. Heard a bang.
    c. Heard a car hitting the mailbox and leaving.
    d. Has to be because he heard something.

2) What was damaged?
    a. Mailbox
    b. The neighbor's mailbox
    c. Mr. White's mailbox
    d. Must contain mailbox (ok if they say his neighbor's mailbox)

3) What type of car does the defendant drive?
    a. Any description is fine if it includes Monte Carlo

4) What did the defendant see when he drove down the road?
    a. A car similar to his except it was 4-door.
    b. A white Lumina (can't say Monte Carlo)
    c. A Lumina
    d. A car similar to his at a neighbor's house
    e. The car he thought hit the mailbox
    f. A similar looking car

5) Briefly, what is the defendant's version of what happened?
    a. Any iteration of someone in a similar car hit the neighbor's mailbox; he did not hit the mailbox.

VITA

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