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Complex Scientific Testimony: How Do Jurors Make Decisions?

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Critics of the civil jury system question whether jurors can adequately evaluate complex expert testimony. Based on current models of research in persuasion, we hypothesized that when expert testimony is complex, factors other than content will influence persuasion. Participants, serving as mock jurors, watched a videotaped trial in which two scientists provided evidence on whether PCBs could have caused a plaintiff's illness. The complexity of the expert's testimony and the strength of the expert's credentials were varied in a 2 × 2 factorial design. After watching the videotape, mock jurors rendered a verdict and completed a number of attitude measures related to the trial. Overall, consistent with our prediction, we found that jurors were more persuaded by a highly expert witness than by a less expert witness, but only when the testimony was highly complex. When the testimony was less complex, jurors relied primarily on the content of that testimony, and witness credentials had little impact on the persuasiveness of the message.

In recent years, civil litigation has increased markedly in complexity. The percentage of trials lasting 10 or more days has quadrupled since 1945 (Wiggins & Breckler, 1991), the result of a growing litigiousness in American society coupled with an increasingly technological environment (Enquist, 1980). This increase in trial complexity has led some legal scholars and judges to question whether there are cases so complex that juries cannot render verdicts fairly based upon a rational evaluation of the evidence (Frank, 1949; Luneburg & Nordenburg, 1987).

On the other hand, many psychologists and legal scholars contend that juries are competent decision makers, even in the most complex cases (Cecil, Hans, & Wiggins, 1991; Kalven & Zeisel, 1966). These researchers have maintained that juries are accurate and efficient fact-finders (Hastie, Penrod, & Pennington, 1983), responsible, and remarkably adept (Guinther, 1988). Although in a few highly publicized cases, jurors professed to ignore large portions of the evidence presented, the perceptions of jurors involved in complex civil litigation generally mirror the

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opinions of the researchers. Cecil, Lind, and Bermant (1987) reported that jurors in the protracted civil cases they studied believed that, although the evidence was difficult, it was still manageable, and thus they came to a principled and reasonable decision.

Is there cause for concern about the complexity of civil litigation on the comprehension and decision-making capabilities of jurors? There are several separable issues. First, the legal issues in a case may be conceptually complex. Jurors are asked to make decisions on causation, liability, and punitive and compensatory damages, often guided only by obscure and linguistically complicated judicial instructions. A large body of empirical research has shown that jurors are not adept at understanding and using legal concepts, with some jurors failing to comprehend over 50% of the judge's instructions on the law (Elwork, Sales, & Alfini, 1977).

Second, jurors may be overwhelmed by the volume of the evidence presented. Gross and Syverud (1991) found that of the 529 civil trials they surveyed, 86% of these trials utilized expert testimony, with an average of nearly four experts per trial. Expert witnesses testified in 97% of the personal injury or death cases, and in 100% of the product liability cases. In 57% of these trials, the experts who testified were opposing experts from the same general area.

A third aspect of complexity involves the complexity of the evidence itself. This may well be the most difficult issue facing jurors. Whereas simplified judicial instructions, allowing jurors to take notes, or granting them access to trial transcripts may mitigate the effects of difficult legal concepts or a high volume of evidence, it is unclear what remedies are appropriate if jurors cannot comprehend the testimony in the trial.

In complex litigation, expert witnesses are often the primary source of substantive evidence in the case. In order to be admitted into a trial, the testimony of the expert witness must be based on specialized knowledge, training, or experience. Experts are often asked to discuss concepts, theories, or information that are outside the realm of common knowledge. When the information is highly technical and scientific, it is almost inevitable that jurors will find the testimony particularly difficult to comprehend (Cecil et al., 1987). And when experts rely on their own specialized language—technical expressions, formality of grammar and syntax, sentence length and complexity—the testimony may become even more alienating to the average juror (Freckelton, 1987).

Furthermore, jurors in long trials are less likely than those in shorter trials to have a college education or specialized knowledge of the issues in the case, either because individuals in their chosen professions are excused from jury duty, or because lawyers use their peremptory challenges to keep those with relevant knowledge off the jury (Cecil et al., 1987). It is not uncommon, therefore, for a juror to be faced with experts who present conflicting, highly complex scientific or technological evidence that is beyond the capability of the average person to understand.

In this report, we will examine the way in which mock jurors make decisions about complex scientific testimony. We assume that jurors have the motivation to render a fair verdict and that they take seriously the need to weigh the evidence no matter how complex and/or contradictory (Cecil et al., 1987). Nonetheless, at some point, the testimony of scientists and engineers may become sufficiently com-

plex as to make comprehension difficult. What do the jurors do then? Do they do the best they can to sift through the complex scientific testimony on both sides of the issue? Do they choose the expert on one side of the issue and form a judgment on his or her testimony? Or, do they find shortcuts or heuristic rules as a way of informing their ultimate judgment?

In the absence of empirical studies specifically designed to evaluate the impact of complex expert testimony on jurors (MacCoun, 1987), it may be useful to look at what is known about persuasion in the social psychology literature. Work in this area is based on the premise that there are two major processes that lead to persuasion. In systematic or central processing (Chaiken, 1980; Petty & Cacioppo, 1986), people scrutinize a communication, analyze its content, and deduce its validity. In this process, persuasion is a function of the quality of the arguments that are presented in a message. The higher the quality of the arguments, the greater the persuasive impact (e.g., Leippe & Elkin, 1987; Petty, Cacioppo, & Goldman, 1981).

However, research on persuasion shows that people do not always carefully scrutinize the quality of a communication. Particularly when the motivation to attend to a persuasive message is lacking, the ability to process the message is not present, or the ability is present but impaired, people revert to a less effortful type of processing known as peripheral or heuristic processing. Instead of attending to the quality and validity of the arguments, we resort to shortcuts, or heuristic decision rules, to determine the value of the message. We tend to rely on a variety of factors associated with the message or the messenger. Is the communicator credible (Hovland & Weiss, 1951)? Did he or she use many arguments to bolster the advocated position, regardless of whether they are good arguments (Petty & Cacioppo, 1984)? Is the communicator attractive (Chaiken, 1980)? Is he or she a bone fide expert about the issue (Hass, 1981)? Is the recipient in a good mood or a bad mood when listening to the message (Biggers & Pryor, 1982)?

The role played by motivation in facilitating peripheral as opposed to systematic processing has been especially well studied. People can lack the motivation to process a message systematically for a number of reasons, but one of the most frequent is that the issue is not relevant for the listener. In an experiment by Petty et al. (1981), participants listened to a message advocating senior comprehensive exams that was ostensibly prepared either by the "Carnegie Commission on Higher Education" (high expertise) or by a local high-school class (low expertise). Results found that participants in a low personal relevance (low motivation) condition were strongly influenced by the source's expertise, and were much more persuaded by the Carnegie than by the high school report. In the high relevance (high motivation) condition, however, source expertise did not affect participants' attitudes. They were persuaded, instead, by the content of the message: the better the message, the more persuasion.

In contrast to Petty et al.'s (1981) experimental situation, we assume that in the courtroom, jurors have the motivation to serve justice, which would include trying to assess the content of the arguments provided by scientific experts. Rather than affecting motivation, we assume that highly complex testimony, especially in complicated scientific matters, affects jurors' ability to process centrally and thus

scrutinize the information. And, indeed, research has shown that limiting participants' ability to process makes listeners resort to the heuristic shortcuts of peripheral processing. Ratneshwar and Chaiken (1991) established a situation in which a message was either highly complex or easily comprehensible. As expected, they found that people systematically processed the simple message but not the complex message. Instead, they relied on a peripheral cue: the apparent expertise of the source of the message. Regardless of the content of the complex message, an audience was more persuaded by a communicator who was supposed to be an expert than by one who was not. Other research has shown similar phenomena when people's ability to process is impaired in other ways. For example, Mackie and Worth (1989) showed that putting the recipients of a message under time pressure pushes them to use heuristic shortcuts rather than process the message's arguments.

In general, the literature on persuasion suggests that jurors upon hearing evidence which they may not have the preparation or background to process will not engage in the careful scrutiny of the testimony. Instead, they will rely on peripheral cues and engage in heuristic processing. When the evidence is scientifically complex, jurors may rely on the credentials of the expert, for example, as a clue to the validity of his or her testimony rather than trying to process the content of the message.

There are, however, some important differences between the experimental situations established for the study of persuasion and more typical situations experienced in civil litigation. In experimental situations, the differences between highly complex messages and simple ones have necessarily been exaggerated. Eagly (1974), for example, made a message complex by randomizing the sentences that were constructed for the simple message. In legal testimony, most experts present information that may vary in complexity, but the complex versions nonetheless make sense and even the simple versions may not result in perfect comprehension. In Eagly's study, the complex version of the message made no sense whatsoever because of the randomization of the sentences. In addition, the differences in source expertise between two experts in a trial are seldom as blatant as the differences between the expertise levels in a typical persuasion experiment. Participants in persuasion experiments are confronted with a choice between a highly prestigious commission or a high-school class, or between a professor or a student. The titles of the communicator tell the subject all that is necessary to arrive at a decision. In complex litigation, however, jurors must often genuinely weigh the fairly similar credentials of the experts to determine who has the greater credibility. Finally, research has generally looked only at the persuasiveness of a message presented by a single messenger. Seldom does only one side in a trial call an expert witness to testify; almost invariably, expert witnesses come in pairs, with each expert on one side being countered by an expert on the other side. Much of the concern about jurors' ability to function adequately in complex trials is generated by the belief that it is too much to expect jurors to weigh accurately the merits of both sides of conflicting and complex testimony.

The present research was designed to evaluate how comprehension of highly complex testimony and the credentials of legal witnesses affect persuasion in the jury decision process. To study this, we attempted to operationalize both comprehension and source credibility in ways that were relevant to complex litigation. Par-

ticipants watched videotapes of trials in which the complexity of the testimony and the level of expertise were varied for the scientific witness for the plaintiff. The content of the testimony itself was held constant. The issues involved and the arguments presented were taken from actual transcripts of expert testimony. Complexity of the testimony, and thus comprehension, was manipulated by varying vocabulary level, syntactic complexity, amount of scientific jargon, and difficulty level of explanations. The level of credibility was varied by representing the witness either as a professor with highly prestigious credentials, or as a professor with less prestigious credentials. The defense was always represented by an expert with highly complex testimony and a highly impressive set of credentials.

It was predicted that, if the witness for the plaintiff gave highly complex testimony, his ability to convince mock jurors would be a function of his credentials. When giving highly complex testimony, jurors would believe the expert more if his education and his publications were impressive and if he taught at a prestigious institution. The plaintiff was expected to win more frequently and have his arguments accepted more by the jurors if complex testimony was provided by a scientist of high credentials rather than a scientist of more modest credentials. Such an effect was not predicted to occur when the testimony was presented in a less complex, more comprehensible format. A statistical interaction between the level of credentials and the degree of complexity of the testimony was predicted, with highly expert credentials affecting judgments following complex scientific testimony.

METHOD

Participants

Participants (n = 54, 40 females and 14 males) were recruited to act as mock jurors from two populations in the Princeton, New Jersey area. Seventy-four percent of mock jurors (n = 40) were local community members recruited via newspaper advertisements. The remaining 14 mock jurors were retirees who responded to flyers posted at a local retirement community. The mock jurors ranged in age from 22 to 75, with a median age of 48. Eighty-eight percent of the mock jurors were white, 6% were African American, and 6% were Hispanic. In response to a question that asked, "How would you describe your economic status?" 62% responded that they were middle class, 21% indicated that they were lower middle class and 17% indicated they were upper middle class. All participants were jury-eligible; 33% had served on juries in the past, while an additional 28% had been called for jury duty but had not been selected to serve. All mock jurors were paid for their participation.

Procedure

Mock jurors participated in the study in small groups ranging in size from two to eight, and groups were randomly assigned to one of four experimental conditions. The high credentials with high complexity, and moderate credentials with

low complexity conditions each contained 12 mock jurors who participated in 4 groups. The moderate credentials and high-complexity condition contained 16 mock jurors who participated in one of 6 group sessions. The high credentials and low complexity condition contained 14 mock jurors who participated in 5 groups. The participants were assured that their responses would be anonymous, were told that they could terminate their participation at any time, and signed an informed consent document. The experimenter then explained that the study was designed to determine how jurors make decisions in civil trials, and that the task of the participants was thus to behave as if they were jurors deciding a real case. Specifically, mock jurors were told that they would be viewing excerpts from a summary jury trial. They were asked to attend closely to both the evidence and the judicial instructions in order to come to a reasoned and rational decision. Mock jurors were also requested to refrain from speaking to each other until the completion of the study. After viewing the videotape, mock jurors provided demographic information and completed a questionnaire individually and without deliberation.

Stimulus Trial

Participants viewed one of four versions of a one-hour-long videotape of a civil case entitled "*Mark A. Stevens v. Keen Co.,* 1991." The transcript for this fictitious trial was adapted from several recent product liability cases in the New Jersey/Pennsylvania area concerning exposure to toxic substances. The case involved a plaintiff who alleged that he had contracted cancer as a result of workplace exposure to polychlorinated biphenyls ("PCBs"). The defense conceded prior to trial that the plaintiff had been exposed to PCBs while working at this facility; the only issue under contention was whether PCBs were a proximal cause of the plaintiff's illness. All evidence pertaining to this issue was provided by the expert witnesses: Dr. Thomas Fallon, Professor of Biochemistry serving as expert for the plaintiff, and Dr. William Campbell, Professor of Epidemiology, serving as expert for the defense.

The videotape consisted of most of the elements of an actual jury trial, save cross-examination. It included: an opening statement of facts in the case,[3] the trial judge's initial instructions to the jury, opening statements by counsel, the examination of expert witnesses for the plaintiff and defense, closing statements by counsel, and the judge's final instructions to the jury. Only one expert was called for each side. The content of all sections of the videotapes was identical except for that containing testimony from the plaintiff's expert.

The information contained in the testimony from the plaintiff's expert witness, Dr. Fallon, was manipulated in two ways: (1) by varying the complexity of the testimony and (2) by varying the strength of the expert's credentials. The manipulation

[3]Pilot testing with community members and graduate students rated how persuasive each lawyers' opening statement was on a 9-point scale, with 9 being very persuasive. The ratings indicated that the opening statements from the plaintiff and the defense were equally persuasive (M's = 2.50 and 3.17, respectively, $t(12) < 1$).

of these variables generated a 2 (complexity of testimony: high vs. low) × 2 (level of credentials: high vs. low) between-subjects design.

The Complexity Variable

The complexity of the testimony was manipulated by varying the type of language used by the witness and the difficulty level of his explanations. In the high-complexity condition, the witness used specialized technical jargon and, in response to questions posed by the lawyer, responded with similarly technical jargon. In the low-complexity condition, the witness used a greater proportion of lay, rather than scientific, terms. The word count of the simple and complex testimony was virtually equal and the organization of the paragraphs was identical. Four graduate students in molecular biology examined the content of the simple and complex testimony and judged them to convey equivalent information.

As an example of the difference in the linguistic complexity, the plaintiff's expert was asked whether there had been other studies conducted to measure the effect of PCBs on animals. In the simple testimony condition, the expert responded:

> Definitely. In 1980, a scientist named McConnell published a summary of the diseases that PCBs cause. He found that PCBs caused several different forms of liver disease in rats, mice, monkeys, and humans. In the rats and mice, PCBs caused not only liver disease but also cancer of the liver. In addition to the liver damage, McConnell found diseases of the immune system as well.

In the Complex testimony condition, the expert responded:

> Definitely. In 1980, McConnell, publishing in the Elsevier Biomedical Press, reported a summary of the pathological findings due to the toxicity of PCBs. He reported tumor induction in rats and mice. He also reported that not only rats and mice, but in monkeys as well, there was hepatomegaly, hepatomegalocytosis and lymphoid atrophy in both spleen and thymus.

The testimony provided by the defense's expert, Dr. Campbell, did not vary by condition, and was designed to be equal in complexity to that of the plaintiff in the high-complexity condition.

The level of complexity was assessed in a pilot test conducted on a sample of 20 participants drawn from the same population as those in the main experiment. Pilot participants were asked to rate the complexity of the testimony provided by the plaintiff's expert. In a between-subjects design, they were exposed either to complex or simple versions of the testimony. Participants were asked, on a 10-point scale, how complex they found the testimony. Consistent with the intended manipulation, the high-complexity testimony was seen as significantly more complex ($M = 6.92$) than the simple testimony ($M = 3.41$), $t(18) = 3.71$, $p < .01$. Pilot participants also rated the complex testimony as more difficult to understand ($M = 9.33$) than the simpler testimony ($M = 5.20$) $t(18) = 2.02$, $p < .05$. When pilot participants were asked, "How persuasive did you find the testimony of Dr. Fallon?" on a 10-point scale, the complex version ($M = 6.83$) and simple version ($M = 6.57$) were not found to differ, $t(18) < 1$. Pilot participants were also asked to rate the experts delivering the testimony on their degree of trustworthiness and credibility. Both experts were rated as reasonably trustworthy ($M = 7.31$) and credible ($M =$

8.02) on 10-point scales. There were no significant differences in the credibility or trustworthiness of the experts as a function of the complexity of their testimony (both t's < 1).

The Expertise Variable

The second experimental manipulation was achieved by varying the level of credentials presented by the plaintiff's witness during his qualification as an expert. In the high-credentials condition, Dr. Fallon stated that he had advanced degrees from several highly prestigious universities, and was now teaching and conducting research at a similar institution. He also said that he had published 45 articles on cancer in peer-reviewed journals, served as editor-in-chief of a biology journal, and gave seminars around the country. In the moderate, credentials condition, Dr. Fallon stated that he had received his educational degrees from small, relatively obscure institutions, and was now employed at a large state university. Additionally, he had published many fewer articles, and held no other scientific or academic positions.

The two sets of plaintiff credentials were also compared in a second, between-subjects, two-group pilot test. Fourteen participants, drawn from the same population as the main experiment, were shown the portion of the video tape in which Dr. Fallon presented his credentials. No scientific testimony was presented. Pilot participants were asked the degree of expertise they believed Dr. Fallon had, how credible he was as an expert and how trustworthy he was as an expert. As intended, the high credentials were seen as making the scientist significantly more expert. On a 10-point scale, the mean expertise of the witness with high credentials was $M = 8.29$, compared to $M = 5.43$ for the witness with moderate credentials, $t(12) = 2.59$, $p < .05$. Similar differences were found for the high-credentialed vs. moderate-credentialed witnesses' credibility, $t(12) = 3.62$, $p < .01$ ($M = 8.74$ and $M = 5.01$, respectively), and trustworthiness, $t(12) = 2.06$, $p < .05$ ($M = 7.31$ and $M = 6.07$, respectively).

The expertise information provided by the credentials of the witness for the defense remained constant throughout all conditions, and was created to be equivalent to that of the plaintiff in the high-credentials condition. Mock jurors in the main experiment answered questions that assessed the comparison between the defense's and plaintiff's credentials and testimony.

Measures

After watching the videotape, mock jurors answered a number of questions about the trial, the participants, and the testimony. First, mock jurors rendered a verdict either for the plaintiff or for the defense, and then rated their confidence in that decision on a 9-point scale.

The crux of the scientific issue was whether PCBs were a proximal cause of the plaintiff's illness. As a continuous, and arguably more sensitive, measure of perceived liability in this case, mock jurors estimated the probability that PCBs

were a proximal cause of the plaintiff's illness by circling a number from 0 to 100 (in multiples of 5). If mock jurors had voted for the plaintiff, they were then asked to determine the amount of money they would award the plaintiff for his pain and suffering. Mock jurors were told that the plaintiff would automatically be adequately compensated for medical bills and lost income, but had requested an additional $500,000 in compensation.

Mock jurors were then asked a series of questions designed to assess their attributions comparing the plaintiff and defense experts and their testimony including the persuasiveness and strength of the testimony, and the likability, knowledge and credibility of the experts. Finally, mock jurors answered a series of ten true/false questions designed to ascertain how much of the testimony they had actually understood and retained. Nine of these questions referred to testimony provided by the experts; the remaining question referred to instructions given by the judge. Comprehension scores were the total number of questions answered correctly.

RESULTS

The Verdict

After viewing the trial, mock jurors were asked to indicate a verdict. Overall, 40 mock jurors (74.1%) voted for the plaintiff and 14 voted for the defense. Consistent with our predictions, more mock jurors found for the plaintiff when his case was presented with highly complex arguments by an expert with high credentials (91%) than when the same evidence was presented by an expert of lower credentials (64%). This difference was significant by Fisher's exact test ($p = .001$). The verdict in favor of the plaintiff shows a different pattern in the simple testimony conditions. Specifically, 64% of mock jurors in the low-complexity/high-credentials group, and 83% of mock jurors in the low-complexity/low-credentials group found for the plaintiff, although this difference was not statistically significant.

The predicted pattern for the verdict data was an interaction between the complexity and credentials variables. In order to test for the interaction, the proportions shown above were analyzed by a log linear analysis of variance. The predicted interaction between level of complexity and strength of credentials was highly significant, $\chi^2(1, N = 54) = 6.91, p < .01$.

Verdict Confidence

To obtain a more sensitive measure of verdict preferences, a scalar variable was created by combining mock jurors' verdicts with their ratings of confidence. Mock jurors were asked to rate how confident they were on a 9-point scale. Verdicts for the plaintiff were assigned positive values, and verdicts for the defendant were assigned negative values. Derived scores on this measure could thus range from +9 (extremely confident that the plaintiff's case was correct) to -9 (extremely confident that the defendant's case was correct).

The confidence data show the same significant interaction pattern as the binomial verdict data, $F(1, 53) = 4.77, p < .05$. Consistent with our prediction, when the testimony was highly complex, the highly credible expert produced significantly greater confidence toward the plaintiff than did the expert whose credentials were less impressive (M's = 6.45 and 1.28, respectively), $t(51) = 2.11, p < .05$. There was also an unexpected tendency for confidence to be higher when the low-complexity testimony was presented by the expert with weaker credentials, but that difference was not statistically significant ($M = 4.17$ for moderate credentials and $M = 1.86$ for high credentials).

Probability that PCBs Caused Cancer

The plaintiff's case was an attempt to show that PCBs were the proximal cause of the victim's cancer. This was the issue that the scientist for the plaintiff and the scientist for the defendant argued about. Accordingly, mock jurors in the experiment were asked to estimate the probability that PCBs were, indeed, the proximal cause of the plaintiff's illness.

As on the other measures, a significant interaction of complexity and credentials was obtained, $F(1, 53) = 12.99, p < .001$ (see Table I for the means). As predicted, when the testimony was complex, the expert with high credentials convinced the jurors that PCBs were the cause of the victim's cancer, $F(1,53) = 5.66$, $p < .01$. The tendency in the simple testimony conditions for the expert with lower credentials to be more convincing was not significant.

Strength of the Arguments

Mock jurors were also asked to indicate the relative strength of the arguments made by the expert for each side. A significant interaction between credentials and complexity on the perceived strength of the experts' testimony was found. Consistent with the previously reported results for verdict, confidence, and probability, the arguments of the plaintiff's complex expert were rated as strongest when he possessed strong rather than weak credentials (M's = 4.64 and 2.75, respectively), $F(1, 53) = 4.54, p < .05$. In the simple testimony condition, the expert whose credentials were moderate was perceived to have stronger testimony than the expert whose credentials were high (M's = 3.33 and 4.81, respectively).[4] That difference was nearly significant, $F(1, 53) = 3.13, p < .10$.

[4]Note: For the strength of arguments measurement, lower numbers indicate *greater* perceived strength of arguments.

Table I. Probability Plaintiff's Illness Was Caused by PCBs

	High complexity	Low complexity
High credibility	95.91_a	52.81_b
Low credibility	49.23_b	69.58_{ab}

Note: Entries with different subscripts are significantly different from each other by simple effects tests ($p < .05$).

Additional Measures

In addition to the dependent measures already discussed, mock jurors were also asked to indicate the amount of money they would award for "pain and suffering. " No differences were found among conditions for this variable. The lack of guidelines for the magnitude of pain and suffering awards combined with no opportunity for discussion produced very large variances on this measure. In addition, ratings of confidence in the verdict were correlated with other measures of the perception of the testimony and the experts. As would be reasonable to expect, confidence in deciding for the plaintiff was correlated with his being more persuasive ($r = .54, p < .0001$), being a 'better expert' ($r = 33, p < .05$), being believable ($r = .42, p < .01$), making stronger arguments ($r = .52, p < .001$), being more knowledgeable ($r = .39, p < .01$), and having more expertise ($r = .31, p < .03$) than the defense expert. Verdict confidence was also marginally correlated with ratings of the plaintiff's expert as: having more experience ($r = .24, p = .09$), being more trustworthy ($r = .25, p = .07$), and being less annoying ($r = .25, p = .08$) than the defense expert.

Following the major dependent measures, mock jurors were asked to compare the plaintiff's expert with the defense's expert. Mock jurors were asked which witness' testimony was more difficult to follow. As expected, in the complex testimony condition, there was no difference between the perceived difficulty of the plaintiff's and defense's expert's testimony. In the simple testimony condition, mock jurors found the plaintiff's testimony easier to follow than the defense's ($M = 3.68$),[5] $t(26) = 2.26, p < .05$. In addition, mock jurors were asked to rate the plaintiff's and defense's experts on the quality of their credentials and which expert was better qualified. On both questions, the plaintiff's witness with high credentials was rated as similarly qualified and highly credentialed as the defense's witness. The defense's witness, however, was rated as being more qualified ($M = 3.75$), $t(26) = 2.30, p < .05$, and as having higher credentials ($M = 4.32$), $t(26) = 2.11, p < .05$, than the plaintiff's witness with moderate credentials.

Comprehension of the testimony was assessed by determining the number of true/false questions about the experts' evidence that a mock juror answered correctly. Overall, memory for the stated facts as assessed on our comprehension test was very good, $M = 7.27$ out of a possible 10. The strong memory scores by all of the subjects did not allow for differences to appear among conditions nor did it allow us to use memory productively as a covariate in the analysis. The only difference found on the memory measure was that mock jurors who voted for the defense were found to have a marginally stronger comprehension of the testimony ($M = 8.10$) than those who voted for the plaintiff ($M = 7.14$) $F(1, 53) = 3.62, p = .06$).

[5]The question asked mock jurors to compare how easy the two experts were to understand on a 9-point scale. A 1 indicated that the plaintiff was much easier to understand and a 9 indicated that the defense was much easier to understand.

DISCUSSION

In complex civil litigation, jurors are in a difficult predicament. In matters that are highly technical and scientific, they are likely to be bombarded with information that they will find difficult to understand. Although they may be motivated to process the information that is entered into evidence, jurors may find it difficult to do so. The results of the present study indicate what jurors may do when processing testimony provided by scientific experts.

Consistent with our predictions, an expert whose scientific testimony was complex was more likely to be believed when his credentials were impressive. Relative to an expert from a less prestigious institution with fewer number of publications to his credit, the expert with impressive credentials was more convincing. Mock jurors sided with the expert with high credentials about the probability that PCBs caused the plaintiff's cancer, were more likely to vote for the plaintiff when the expert with higher credentials presented the case, and were more confident in their judgments. The expert with more modest credentials presented precisely the same case, made the same arguments based on the same data. Like the expert with high credentials, the expert with modest credentials had a Ph.D., taught at a college, and published original research. Nonetheless, when the testimony was complex, mock jurors used the degree of the expert's credentials as the basis for their judgments. However, when the evidence was presented in more comprehensible language, the advantage of having impressive credentials disappeared. There was no significant difference in the verdict, confidence, or probability data as a function of the expert's credentials when the testimony was easy to understand.

A facet of procedure of the current study that should be commented on is our decision to establish a fixed pattern of testimony for the defense. The defense's expert testimony was always complex and his credentials were always impressive. One alternative approach to the study of complex testimony may have been to study the plaintiff's testimony without presenting any information about, or from, the defense. We elected to have a defense position in order to augment the ecological validity of the situation for jurors. Having attorneys present their witnesses on each side of the controversy made it more realistic for mock jurors and facilitated their treating the stimulus material as a real trial. Whether the particular level of the defendant's testimony or credentials had an impact on mock jurors' responses to the independent variables is itself an interesting question that may be the topic of future research.

In general, the major data from our study show a pattern that is supportive of Petty and Cacioppo's (1986) and Chaiken's (1980) views of persuasion. It is likely that systematic elaboration of the expert's message was blocked when the testimony was too complex to be easily understood. In those conditions, mock jurors seem to have based their assessments on variables unrelated to the content of the message—in this case, the level of credentials of the expert. It is interesting to speculate on what other variables unrelated to the message mock jurors might have used if credentials had not been available. For example, might jurors have relied on the expert's body posture, smile, or clothing? Might they have been more influenced by an expert who came from their hometown or who, in some way, put the juror

in a good mood? The heuristic cue that mock jurors relied on in the current study bore some relationship to the assessment the jurors were asked to make. A juror may have thought: I cannot understand what the scientist is saying but his credentials are so unassailable that I will take his side of the argument. An expert's smile, patience, eye contact, and so forth require a larger leap for a mock juror to make a logical connection to the correctness of his argument. It is an interesting question for further research to assess whether there are limits on the types of heuristic cues that mock jurors will use in assessing the validity of expert testimony.

There is one intriguing respect in which the present study produced findings that we did not predict. In conditions in which the expert witness' testimony was simple, there was a tendency for the expert with lower credentials to be more persuasive. Note that with the low-complexity testimony, 83% of the jurors voted for the plaintiff's side when the expert had modest credentials, while only 64% voted for the plaintiff when the low-complexity testimony was offered by the expert with high credentials. Although this difference was not statistically significant, it is paralleled by similar tendencies for the verdict confidence result as well as for the belief that PCBs were the proximal cause of the plaintiff's illness. To the extent that these differences may be meaningful, they would appear to lie outside of the persuasion models.

One possible explanation for these findings is based on the consequences of violated expectancies. It is conceivable that the credentials of the expert established a probability or expectation in the minds of the mock jurors about the level of specialized language, sentence structure, and vocabulary that they were about to hear. An expert with the pedigree and reputation suggested for the witness with high credentials may have established an expectation that the testimony of this witness—as contrasted to testimony of the expert of lower credentials—will be highly complex. When it turned out not to be complex, it produced a violated expectancy. Carlsmith and Aronson (1963) have shown that violated expectancies produce a negative emotional state. Consequently, it may be that when testimony is reasonably simple and comprehensible in lay language, the expectancy established by the expert with high credentials is violated, leading to negative affect, dislike of the communicator, and lower persuasion. Of course, this explanation is purely speculative, and it should be remembered that the differences found between experts in the simple testimony condition did not attain statistical significance.

It is interesting to note another consistent tendency in the data. For most of the dependent measures, greater persuasion was found for the highly complex testimony than the simple testimony when the expert had very high credentials. This difference was significant for the verdict, the assessment of the probability that the plaintiff's cancer was caused by PCBs and for the perceived strength of the arguments. The explanation for this finding is not immediately apparent. One possibility is that, as soon as the mock jurors heard the impressive credentials of the expert, they engaged in peripheral rather than central processing. Once they were in peripheral processing, the combination of the credentials and the impressive-sounding language led to a heuristic of greater convincingness than for either the credential or complexity cue presented alone. Although this explanation would account for the difference found for complexity with a high credentialed source, it does not

explain why subjects who heard the simple testimony from the low credible source believe that testimony as much as, if not more than, when it came from the high credible source. If impressive credentials cause people to engage in peripheral processing, it seems more likely that the impressively high credentials would lead to greater persuasion. Further research seems warranted to search for a complete explanation for the effect of the complexity of testimony delivered by the high-credentialed source.

The use of heuristic cues by the mock jurors in the high-complexity condition may have implications for decisions made by those who prefer to think of courtroom juries as being influenced by the truth of a communication. Consider, for example, a biotechnology company that has to decide whether to produce a new pesticide that it believes is safer for the environment. Assuming the company has conducted all of the tests that are necessary to assure the safety of its product and assuming that the company is reasonably sure that it can present the appropriate evidence to a jury should there ever be civil litigation over the product's safety, will the company decide to market the pesticide? Our results suggest that the mere knowledge that scientists can present all of the valid and relevant scientific tests to a jury might not quell the doubts that the company may have about its exposure to liability. When testimony is complex, jurors may be less inclined to process or scrutinize the communication of the evidence and more inclined to base their decisions on heuristic cues present at the time. This in no way is meant to demean jurors who may be doing the very best they can to make reasonable decisions. However, the data suggest that, even assuming the jurors' most well intentioned motivations, the processing of complex scientific evidence may rest not only on the validity of the arguments but on the subtle heuristic cues such as those relevant to the schooling and employment of the expert. How many other heuristic cues the jury may consider awaits the outcome of further empirical investigations.

Finally, it is important to be mindful that the current data demonstrate the effect of heuristic cues on judgments of expert testimony by individual jurors. How a jury may deal with the complexity of the issue in its deliberative process may become a fascinating new area of investigation. While many important factors affect the interactions among jurors during deliberation, adjudicating an issue in which scientific testimony plays an important part may highlight certain significant variables. For example, the presence of an individual who claims knowledge in an area may imbue that person with special influence in trials involving expert scientific testimony. It is interesting to consider whether heuristic cues are likely to become more or less important during the deliberative process. It is possible that, as jurors discuss the issues, they may become cognizant that their opinions were based more on the expert's credentials than on the substance of his or her testimony. This cognizance may shift opinions away from the heuristic cue and toward the substance of the testimony. On the other hand, it is also quite reasonable that, in the deliberative process, jurors who made their initial judgments based on the substance of testimony perceive disagreement about the testimony in the group discussion. Consequently, they may be persuaded to form their final judgments in line with the expert's credentials rather than his or her testimony. Empirical investigation looking

specifically at jury dynamics in the special case of complex expert testimony would seem to be a fruitful avenue to explore.

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