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### The Effects of the Courtroom Context on Children's Memory and Anxiety

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## The effects of the courtroom context on children's memory and anxiety

BY REBECCA NATHANSON, PH.D.  
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*Modifications of the courtroom environment have been proposed to enhance the ability of child witnesses to offer complete and accurate testimony and reduce system-induced stress. However, these interventions have often been conceived without the benefit of empirical data demonstrating intervention efficacy. The present study examines the effects of the courtroom context on children's memory and anxiety. Eighty-one eight- to ten-year-olds participated in a staged event involving bodily touch, and two weeks later their memory for the event was tested. Half of the*

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*children were questioned in a mock courtroom in a university law school, and half were questioned in a small, private room adjacent to the courtroom. Children's heart rate was monitored throughout questioning. Results indicated that children questioned in the courtroom showed impaired memory performance and greater heart rate variability, indicative of a stress response, when compared with children interviewed in the small, private room.*

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In recent years, a number of questions have been raised about child witnesses. Is their testimony reliable? Is testifying too stressful? Reform efforts have been undertaken to optimize children's testimony and minimize their distress while preserving the rights of the accused. Legal reforms emerged, such as testimony from a private room adjacent to the courtroom via closed circuit television.<sup>1</sup> Preparation programs appeared, empowering children to better cope with the inevitable stresses of the adversarial system.<sup>2</sup> As with many policies, interventions were often conceived without the benefit of empirical data demonstrating intervention efficacy.<sup>3</sup> Thus far there has been little research to identify the influences of the courtroom environment on the quality of evidence children offer and the level of stress they experience.

For a thoughtful policy analysis, research with a dual objective is needed—research that explores not only the interaction between ongoing developmental processes, but also the situation-specific effects on performance in the legal context.<sup>4</sup> Ideally, legislators and courts could then arrive at empirically justified decisions that match the real world.<sup>5</sup> Practitioners could develop efficacious methods for optimizing children's performance and reducing their stress in particular legal contexts. To bridge this gap, the present study examines the effects of the courtroom context on children's memories of a past event and their anxiety before and during mock testimony.

## **Effects of the courtroom context**

Is children's testimony promoted, undermined, or unaffected by the courtroom context? Traditionally, the formality of the courtroom is assumed to promote eyewitness testimony by underscoring the seriousness of the task and the consequences of error, promoting effort and motivation. By this logic, one would expect more reliable testimony from witnesses in court than in other settings. However, when the witness is a child, the unfamiliar setting, formal atmosphere, and incomprehensible procedures could be distracting and confusing. This could interfere with attentional resources and retrieval strategies even when court is not experienced as stressful. Studies have documented young children's lack of familiarity with many legal concepts, procedures,<sup>6</sup> and terms.<sup>7</sup> Most reforms, however, are based on the assumption that the courtroom is experienced as stressful. The concomitant emotional and physiological stress reactions are thought to interfere with remembering. High levels of stress are thought to decrease attention, to reduce motivation, or to interfere with efficient memory searches on the stand.<sup>8</sup>

Another option is also possible. The kind of memory necessary for testimony (i.e., deliberate free recall and responses to questions about autobiographical events) may be robust in the face of transient emotional states and unfamiliar settings. In this case, little differences would be noted as a function of context. This may be especially true of children's responses to direct questions, which offer ample recall cues, about personally meaningful events that are highly memorable. Hence, it is unclear whether memory performance would be promoted, undermined, or unaffected by the courtroom environment.

## **Heuristic framework**

Children's testimony is best understood from a theoretical framework that explains the effects of the psycho-social envi-

ronment, affective state, self-image, and social support on memory performance. These factors are paramount in the legal context. Traditional models of children's memory have failed to address these factors, focusing primarily on the development of strategy use, meta-cognition, and knowledge base. Theories of motivated remembering,<sup>9</sup> however, postulate an important role for expectations and emotions as mediators of the discrepancy between memory capability and memory performance.

Within the framework of motivated remembering, deliberate attempts to remember, such as testifying, involve a variety of tasks at multiple levels of processing. These are not necessarily conscious activities. The memory product is determined by the selection of a response strategy among alternatives and the belief that it will produce a specific outcome. Children make a metacognitive appraisal of the task (e.g., consequences of error, amount of effort required) and of strategy effectiveness, as well as of the anticipation of outcomes and consequences (rewards, penalties). They perform a cost-benefit analysis to determine if the expected outcome is worth the effort required. Then memory is searched, retrieval strategies are generated, and results are evaluated.

According to this theory, an expanded set of variables becomes potentially influential. Memory can be influenced by the child's view of testifying as an interesting and challenging task or as a stressful and unpleasant one. The context of the court can provide either support (cues, feedback, encouragement) or interference (time pressure, discouragement). Children's perceptions of self-efficacy (insecurity, grandiosity), their coping patterns (denial, avoidance, hypervigilance, mastery), and their emotions (indifference, ambivalence, fear) can affect the memory product. For example, individual differences could distort judgments about the value and utility of a strategy choice or the probability of a particular outcome. Low self-esteem, common among maltreated children, could inflate the probability of memory failure and

minimize the value of success, reducing effort and motivation. Adopting this model, we have hypothesized elsewhere that children's courtroom memory performance may be influenced by characteristics of the courtroom setting, legal knowledge, past court experience, perceptions of the task demands of testifying, social support, self-esteem, emotional reactions, and coping patterns.<sup>10</sup>

### **Relevant research**

The effects of context on both memory and stress are well documented in the laboratory. Context is not simply the place in which remembering occurs, but a constituent of memory itself. The physical and psychological setting in which remembering transpires influences ability to recall. For example, researchers found that children's uses of prospective memory strategies were far less efficient in an unfamiliar laboratory setting than in the child's home.<sup>11</sup> They speculated that the laboratory setting induced anxiety incompatible with the deployment of the memory strategy under study. Similarly, children's stress level is affected by different contexts. For example, children show less stress in familiar than in unfamiliar settings.<sup>12</sup>

Reviews of the child-witness literature tend to support the conclusion that the courtroom context can be stressful for some children and that testimony may be impaired by heightened emotional arousal.<sup>13</sup> One review concluded that confronting the accused, lack of social support, lack of familiarity, lack of legal knowledge, and intensive questioning are potential sources of stress for child witnesses.<sup>14</sup> Many of these conclusions are based on the results of ratings by genuine child witnesses in the field.<sup>15</sup> Unfortunately, such field studies cannot address memory accuracy because there are rarely videotapes or photographs against which to compare the child's version of events. Additionally, the most sensitive measures of stress (physiological correlates of anxiety

during testimony) and the most rigorous research designs (random assignment) are rarely possible, because they might interfere with prosecution and defense. Analog studies alone, however, cannot recreate the complexities of a real trial nor the emotions of crime victims. Hence, a thoughtful policy analysis requires the integration of findings from both analog and field studies.

We located only three analog studies of children's memory performance in a mock courtroom setting. In the first,<sup>16</sup> children's recall of a videotaped event was examined. The authors reported trends toward worse free recall, fewer correct answers to specific questions, and more "I don't know" responses in a courtroom than in a small, private room. However, some of these trends were marginal and did not reach statistical significance. Anecdotally, the authors noted more instances of nervousness in the courtroom than in the private room. The second study<sup>17</sup> compared children's recall for a staged event and children's anticipatory anxiety prior to questioning across two contexts: a mock trial and a private room at school. Children questioned in court showed less complete free recall, made more errors in direct questioning, and acquiesced to misleading questions more frequently than age-mates questioned at school. Children questioned in court identified certain court-related experiences as more stressful than peers interviewed at school. Also, children's perceived anxiety was negatively correlated with correct free recall; the greater the anxiety, the less the information reported.

In the only other mock-courtroom study located,<sup>18</sup> an elaborate mock trial was staged to study the effects of presenting children's testimony via closed circuit television in comparison to presentation in the open courtroom. In contrast to the two studies above, the authors failed to find differences in the completeness of free recall or error rates as a function of setting, although they did find that closed circuit technology was associated with decreased suggestibility for younger children. They also found that children expecting to testify in

court expressed greater anticipatory anxiety than those expecting to be questioned in the closed circuit condition. In support of the need for preparation, greater legal knowledge was associated with less anxiety about taking the stand and more correct responses to direct questions, though it was not related to free recall. These studies begin to bridge the gap between research, policy, and practice; however, it would be premature to formulate conclusions on the basis of such inconsistent and patchy data.

The present study extends this literature by measuring physiological correlates of anxiety (heart rate) during mock testimony and children's perceptions of courtroom characteristics and task demands. We also began to explore the role of individual differences in legal knowledge, past court experience, social support, and self-competence as mediators of courtroom stress and memory performance. Eighty-one eight- to ten-year-olds participated in a staged event and two weeks later were questioned regarding their memory for the event. Half were questioned in an open courtroom context and half in an adjacent private room. Memory performance, self-report of anticipatory anxiety, heart rate patterns during questioning, legal knowledge, past court experience, perceptions of court-related stress, self-concept, and perceived social support were examined.

Primary hypotheses predicted that children questioned in the courtroom environment would demonstrate impaired memory performance and greater anxiety in comparison with children questioned in an adjacent room. We predicted that higher levels of anxiety would be associated with impaired memory performance. Exploratory hypotheses predicted that higher levels of legal knowledge, past court experience, self-perception, and perceived social support would be associated with less anxiety and better memory performance.



## Method

- Subjects** Eighty-one eight- to ten-year-old children participated in this study ( $M = 108.9$  months,  $SD = 9$  months). There were 44 males and 37 females. The sample was 86% Caucasian, 12% Hispanic, and 1% Asian. The children were recruited from public elementary schools in a middle-class to upper-middle-class suburban area in Southern California. Their parents/guardians were contacted through the schools by letter for written consent. Children then gave their verbal and written assent prior to participation in the study.
- Design** A  $2 \times 2$  design was implemented to evaluate the effects of the environment and gender on children's memory and anxiety. Children were randomly assigned to one of two interview environments; courtroom ( $N=41$ ) or private room ( $N=40$ ). Children's memory was tested with two memory tasks: free recall followed by specific questions. Anticipatory anxiety was measured by self-report on the State-Trait Anxiety Inventory for Children (STAIC Form C-1)<sup>19</sup> and the Court-Related Stress Scale.<sup>20</sup> Anxiety during recall was measured by heart-rate standard deviations that served as an index to heart-rate variability (HRV). Legal knowledge, past court experience, self-perception, and perceived social support were also assessed.
- Staged event** The stimulus to be remembered was a 30-minute staged event in which children were taught about the parts and functions of the human body by a male research assistant. The event included activities that involved bodily touch, such as measurement of heart rate, visual inspection of the esophagus, and listening to the lungs, so that later questioning of the children could resemble questions typically asked of children suspected of being abused—for example, "Where did he touch you?" or "Did he put something in your mouth?" The event was videotaped each time it occurred for later comparison with the children's memory.

- Measures**
- Wide range assessment of memory and learning (WRAML)*<sup>21</sup> The WRAML, a standardized psychometric test of memory and learning ability, was administered to ensure that all children's memory functioning was within normal range and that groups were comparable on general memory function. The Screening Form, a short form comprised of Picture Memory, Design Memory, Verbal Learning, and Story Memory, was utilized. Subtest scaled scores were computed and transformed into a Memory Screening Index. In the normative sample, Memory Screening Indices range from 47 to 154 ( $M = 100$ ) for the age range sampled in this study.
- Legal knowledge test*<sup>22</sup> The Legal Knowledge Test was administered to assess children's level of knowledge about the investigative and judicial process prior to participating in the study. The scoring system is modeled after the scoring system of the vocabulary subtest of the WISC-R.<sup>23</sup> Responses to each of 35 questions were scored as two, one, or zero, depending upon the degree of understanding demonstrated. Two points were given for a correct, well-established answer involving defining features of the concept (e.g., "a crime is when someone breaks the law"); one point was given for a correct but vague or less relevant answer (e.g., "a crime is when someone breaks the rules"); and zero points were given for an incorrect answer (e.g., "a crime is something you do in court"). Item scores were summed.
- Court experiences questionnaire*<sup>24</sup> The Court Experiences Questionnaire was administered to assess children's experience with the investigative and judicial process prior to participating in the study. Scores served as an indicator of one source of children's knowledge about the legal system. Children were questioned about each of nine legal experiences (e.g., testifying in court). Each response was scored as follows: Active participant = 3, such as a victim or witness; Active observer = 2, such as being the relative or friend of a victim or witness; Passive observer = 1, for example, if the child was a participant in a field trip to a courtroom; and no previous experience = 0. Scores served as

an indicator of one source of children's knowledge about the legal system.

*Self-perception  
profile for  
children*<sup>25</sup>

This standardized measure was administered to explore the relationships among self-image, memory performance, and stress. A global self-worth score was obtained, measuring the extent to which a child likes himself as a person, is happy in the way he is leading his life, and is generally happy with the way he is. This scale has a mean value of approximately 2.9 and a standard deviation of approximately .60 for the age range of the children sampled in this study.

*Social support  
scale for  
children*<sup>26</sup>

This standardized measure was utilized to explore the relationships among perceived social support, memory performance, and anxiety in a courtroom and a non-courtroom setting. This scale measures children's perceptions of the support provided by significant others, such as parents, teachers, classmates, and close friends. This scale has a mean value of approximately 3.0 and a standard deviation of approximately .60 for the age range of the children sampled in this study.

*Children's social  
desirability scale  
(CSDS)*<sup>27</sup>

The CSDS was administered to assess children's social desirability. This instrument consists of 47 yes/no questions such as "Are you always polite to older people?" and "Do you ever get angry?"

*Memory  
interview*

A structured interview was developed to assess free recall and responses to specific questions about the staged event. A narrative of the staged event was elicited (e.g., children were asked to tell everything they could about the time they went into a new classroom with some other students from their class). One prompt, "Is there anything else you can tell me about that time?", was given at the conclusion of the child's narrative.

Next 60 specific questions were administered: 19 direct questions unrelated to abuse (e.g., "What was the first thing you did when you walked into the room?"); 17 leading questions

unrelated to abuse (e.g., “The man was in the room with you, wasn’t he?”); and 24 abuse-related questions ranging from highly suggestive to non-leading (e.g., “You took your clothes off to play the body parts game, didn’t you?” “Which part of his clothes did the man take off?”). Thirty-three of the questions required a yes/no response, and 27 of the questions required short answers. The questions, modeled after questions typically asked in actual witness interviews, elicited information about the participants, objects, and actions involved in the staged event.

*Court-related stress scale*<sup>28</sup>

The Court-Related Stress Scale was administered to assess children’s perceptions of the degree of stress associated with various court-related experiences such as “having an attorney ask you questions in court” or “answering embarrassing questions in court.” This 37-item instrument is comprised of 17 court-related experiences embedded among 20 life experiences from the Stressfulness of Life Events Scale.<sup>29</sup>

Children rated each experience on a five-point scale (5 = very, very stressful; 3 = upsetting; 1 = not stressful, not upsetting). Stressful was defined as something “upsetting” or that “bothers you.” Various grimacing faces were used instead of numbers to represent ratings from not stressful to very, very stressful. Each experience was read aloud, one at a time, by an interviewer, and children were instructed to put an X on the corresponding face to reflect how stressful they perceived the event to be. Children’s responses on the 17 court-related items were summed to create a score on the Court-Related Stress Scale.

*State-trait anxiety inventory for children (STAIC)*<sup>30</sup>

The STAIC was administered to measure state and trait anxiety. Raw scores on the STAIC range from 20 to 60, with 60 reflecting the most anxiety. This scale has a mean score of approximately 37 for the age range sampled here.

*Heart rate* A biotachometer was used to measure continuous heart rate while children were being interviewed. An ear clip was attached to the child's earlobe, and the Bio Tach Rate Meter measured and recorded heart rate beat by beat. Heart rate readings from the equipment sensors were fed through digital readout monitors directly into an IBM personal computer and recorded at 1/10-second intervals throughout the interview. Heart rate standard deviations were calculated and served as an index to heart rate variability (HRV).

*Interview performance assessment (IPA)*<sup>31</sup> The IPA was administered to assess children's perceptions of the interview. This 19-item measure assesses children's perceptions of the interviewer's expectations, his perceptions of them, and their perceptions of their own performance. For example: "Did you feel he wanted you to answer some of the questions in a certain way?" "How much do you think he liked you?" "How well do you think you did answering questions?" Children respond in a five-point Likert scale format.

**Procedure** Randomly assigned to groups of four, children participated in the staged event in an empty classroom at their school with a male research assistant. During the staged event, children's heart rates were recorded four times at 30-second intervals over a two-minute period. A mean of these heart rates yielded each child's baseline heart rate score.

During the next week, children were taken out of their classroom for approximately 40 minutes by a research assistant who was not involved in the staged event. The WRAML, Legal Knowledge Test, Court Experiences Questionnaire, and STAIC (Form C-2) were administered individually in an empty classroom.

Two weeks after participating in the staged event, all children were taken on a field trip to a university law school. First, the Self-Perception Profile for Children, Social Support Scale for Children, and CSDS were administered in an empty classroom adjacent to a mock courtroom.

Each child to be interviewed in the private room was then shown the private room where another child was being questioned. Each child to be interviewed in the courtroom was shown the courtroom that simulated a trial environment, including the use of actors for the judge, attorney, and bailiff; community volunteers for the jurors/spectators; and a child being questioned on the witness stand. Each child was then told he/she was going to be questioned next. When the child returned to the waiting room, the Court-Related Stress Scale and STAIC (Form C-1) were administered individually as measures of anticipatory anxiety.

Prior to questioning, the "bailiff" walked each child assigned to the courtroom condition to the witness stand, where they took an oath to tell the truth. An earclip was then attached to the child's earlobe to measure continuous heart rate during questioning. Then children were questioned from a lectern by a male law student dressed formally in a dark suit.

Children assigned to the private-room condition were led to a small empty room adjacent to the courtroom, where they were seated across a table from the same male law student who questioned the children in the courtroom-interview environment. An earclip was then attached to the child's earlobe to measure continuous heart rate during questioning. Care was taken to ensure that the interviewer displayed the same demeanor in both conditions. For both conditions, the same free-recall instructions were given first, followed by the same 60 specific questions. All interviews were audiotaped and videotaped.

At the conclusion of the interview, children interviewed in both environments were escorted to the waiting room for administration of the IPA. At the conclusion of the data-collection phase, children were debriefed regarding the full nature of the study. In addition, they engaged in a brief lesson about testifying in court, which included role-playing various roles in the courtroom, such as judge, attorney, and witness.

Throughout the study children were aware that they were participating in an experiment, not an actual trial.

**Data  
reduction**  
*Free recall*

A 105-item checklist of the participants, objects, and actions involved in the staged event was generated by the authors from the script of the staged event. Then the videotape of each staging was viewed to note any deviations from the script. Thus children's memories were compared with the videotape of the precise staged event in which they participated. Audiotapes of the interviews were transcribed. Children's free-recall responses were scored as correct based upon the co-occurrence of recall with individual items on the verified checklist. For example, "The man listened to my heart with the stethoscope" was scored as four correct points because it corresponds to four items on the checklist: a participant, action, and two objects (e.g., heart and stethoscope), respectively.

Free-recall responses were scored as incorrect if they were vague or irrelevant or if they erroneously co-occurred with individual items on the checklist. For example, "The man listened to my lungs with the stethoscope" was scored as three correct points and one error because it corresponds correctly to three items on the checklist but erroneously recalls "lungs" instead of "heart."

*Specific  
questions*

Children's responses to specific questions were scored as correct, incorrect, or "don't know/don't remember."

*Heart rate*

All heart rates of less than 40 and greater than 165 were attributed to equipment error and deleted from the data set. Approximately 8% of the data points from the sample fell into these ranges and were deleted. Heart rate standard deviations were then calculated for each child and served as an index to heart rate variability (HRV). Individual differences in interview time resulted in differences in the number of heart rates generated per child (range = 300 to 700 beats) from which the mean standard deviations of heart rate were calculated.

*Interrater reliability* Two coders blind to interview condition coded 25% of the memory protocols. Ninety-three percent point-by-point interrater reliability was obtained on free recall and on responses to specific questions.

## Results

**Preliminary analyses** To better understand the nature of the sample, preliminary analyses were conducted to ensure that children interviewed in both the courtroom and the private room were comparable on memory ability, legal knowledge, prior court experience, self-image, perceived social support, trait anxiety, and social desirability. No significant differences between the two groups were found. Means and statistical test results are depicted in Table 1.

TABLE 1

Measure	Interview Condition		F
	Court	Non-Court	
WRAML	89.46 (13.62)	93.45 (13.15)	1.34
Legal Knowledge Test	16.24 (7.97)	17.41 (7.25)	0.77
Court Experiences Questionnaire	7.20 (3.27)	8.14 (4.49)	1.61
Self Perception Profile for Children	3.44 (0.57)	3.47 (0.51)	0.04
Social Support Scale for Children	3.40 (0.41)	3.44 (0.48)	0.20
STAIC Form C-2	36.80 (9.17)	34.97 (6.54)	0.88
CSDS	23.32 (9.74)	26.18 (9.41)	1.43

NOTE: Standard deviations appear in parentheses.



**Effects of interview environment on memory** To analyze the effects of interview environment on memory performance, two 2 (interview environment)  $\times$  2 (gender) multivariate analyses of variance (MANOVAs) were conducted. In the first, the amount of correct free recall and the number of correct responses to specific questions were entered as dependent variables. In the second, free-recall errors and the number of incorrect responses to specific questions were entered as dependent measures. Table 2 displays these means and statistical test results.

*Correct recall* The first MANOVA revealed a significant effect of interview environment on correct recall,  $F(2,76) = 8.00, p < .001$ . Univariate tests of free recall revealed that children interviewed in the courtroom recalled significantly fewer pieces of information than children interviewed in the private room ( $M_C = 5.11, SD_C = 5.16; M_{PR} = 9.90, SD_{PR} = 6.22$ );  $F(1,77) = 6.18, p < .001$ . Moreover, 27% of children interviewed in the courtroom failed to recall the staged event at all in response to free-recall instructions in comparison with only 7.5% of children interviewed in the private room. This difference was statistically significant,  $\chi^2(80) = 5.29, p < .05$ . Responses to the 60 specific questions were not affected by interview environment.

Analyses on subsets of questions revealed a significant interview-environment effect on the number of correct responses to the subset of 19 direct questions unrelated to abuse. There was a small but reliable difference. Children interviewed in the courtroom responded correctly to these questions significantly less often than children interviewed in the private room ( $M_C = 9.71, SD_C = 3.26; M_{PR} = 10.91, SD_{PR} = 2.25$ );  $F(1,77) = 4.02, p < .05$ . Responses to the subsets of leading and abuse-related questions were robust and unaffected by interview condition.

*Errors* A second MANOVA conducted on errors in free recall and incorrect responses to specific questions failed to reveal any significant effects. Analyses of variance were conducted on

incorrect responses to direct, leading, and abuse-related questions. No significant differences between the two interview environments emerged. Univariate tests on incorrect responses to specific questions, however, revealed a significant gender effect, with males responding incorrectly to specific questions significantly more often than females ( $M_M = 15.44$ ,  $SD_M = 4.66$ ;  $M_F = 13.25$ ,  $SD_F = 4.46$ );  $F(1,77) = 4.44$ ,  $p < .05$ .

*Don't know* A 2 (interview environment)  $\times$  2 (gender) ANOVA was conducted on "I don't know" responses to specific questions. An interaction effect emerged, with females interviewed in the courtroom responding with "I don't know" ( $M_{CF} = 10.92$ ,  $SD_{CF} = 8.95$ ) significantly more often than males interviewed in the courtroom ( $M_{CM} = 6.30$ ,  $SD_{CM} = 4.30$ ). They also responded more frequently with "I don't know" than males ( $M_{PRM} = 7.86$ ,  $SD_{PRM} = 4.25$ ) or females ( $M_{PRF} = 7.06$ ,  $SD_{PRF} = 4.55$ ) interviewed in the private room,  $F(1,77) = 4.64$ ,  $p < .05$ .

TABLE 2

Memory Measure	Interview Condition		F
	Court	Non-Court	
<b>Free Recall</b>			
Correct	5.11 (5.16)	9.90 (6.22)	15.81*
Incorrect	0.32 (0.69)	0.63 (0.83)	3.09
<b>Specific Questions</b>			
Correct	35.66 (6.82)	36.76 (4.74)	0.93
Incorrect	14.58 (5.15)	14.29 (4.19)	0.00
Don't Know	8.21 (6.93)	7.46 (4.37)	0.84

NOTE: Standard deviations appear in parentheses.  
\* $p < .001$ .

In sum, eight- to ten-year-olds who were questioned in a courtroom showed memory impairments in the form of significantly less complete free recall and fewer correct responses to direct questions unrelated to abuse than age-mates questioned in a private room. However, the courtroom context was not associated with increased error on any of the memory measures, and questions related to abuse as well as misleading questions were unaffected by the context. Thus the amount of correct information produced was diminished, but no greater number of errors was produced in court. Additionally, girls questioned in court declared lack of knowledge in response to specific questions more frequently than other groups.

**Effects of  
interview  
environment  
on anxiety**

To analyze the effects of interview environment on children's anxiety level, two self-report measures of anticipatory anxiety and one physiological measure of anxiety during recall were analyzed. Scores on the STAIC (Form C-1), the Court-Related Stress Scale, and SD of heart rate were entered into a 2 (interview environment)  $\times$  2 (gender) MANOVA. Analyses revealed a significant effect of interview environment,  $F(3,72) = 5.91, p < .001$ . No effects of gender and no interaction effects were detected. Means and statistical test results are displayed in Table 3.

Univariate tests of SD of heart rate revealed that children interviewed in the courtroom demonstrated significantly more heart rate variability (HRV) than children interviewed in the private room ( $M_C = 13.88, SD_C = 7.54; M_{PR} = 7.91, SD_{PR} = 4.18$ );  $F(1,74) = 17.42, p < .0001$ . Both self-report measures failed to yield significant context effects.

Univariate tests on the Court-Related Stress Scale revealed a significant gender effect, with females reporting significantly greater anticipatory anxiety associated with various courtroom experiences than males ( $M_F = 59.37, SD_F = 11.95; M_M = 53.14, SD_M = 13.64$ );  $F(1,77) = 4.33, p < .05$ .

TABLE 3

<b>Mean values on measurements of anxiety by condition</b>			
Anxiety Measure	<u>Interview Condition</u>		<i>F</i>
	Court	Non-Court	
STAIC Form C-2	30.95 (5.21)	30.45 (5.11)	0.29
Court-Related Stress Scale	56.00 (11.87)	55.88 (14.50)	0.44
Heart Rate Reactivity Index	13.88 (7.54)	7.91 (4.18)	17.42**
	Male	Female	
STAIC Form C-2	30.51 (5.02)	30.91 (5.34)	0.18
Court-Related Stress Scale	53.14 (11.87)	59.37 (14.50)	4.33*
Heart Rate Reactivity Index	11.31 (7.03)	10.22 (6.37)	0.12

NOTE: Standard deviations appear in parentheses.  
\* $p < .05$ ; \*\* $p = .0001$ .

Univariate tests on the individual items on the Court-Related Stress Scale revealed a significant interview-environment effect. Children interviewed in the courtroom rated "Not understanding what you are supposed to do in the courtroom" as significantly more stressful than children interviewed in the private room ( $M_C = 3.53$ ,  $SD_C = 1.22$ ;  $M_{PR} = 3.05$ ,  $SD_{PR} = 1.34$ );  $F(1,74) = 3.94$ ,  $p < .05$ . Females also rated this item as significantly more stressful than did males ( $M_F = 3.71$ ,  $SD_F = 1.18$ ;  $M_M = 2.93$ ,  $SD_M = 1.30$ );  $F(1,74) = 8.92$ ,  $p < .01$ . In addition, females rated "Answering embarrassing questions in court" ( $M_F = 4.11$ ,  $SD_F = 0.99$ ;  $M_M = 3.40$ ,  $SD_M = 1.40$ );  $F(1,74) = 6.70$ ,  $p < .01$  and "Answering questions in front of a person who hurt you" ( $M_F = 3.69$ ,  $SD_F = 1.28$ ;  $M_M = 3.02$ ,  $SD_M = 1.39$ );  $F(1,74) = 4.27$ ,  $p < .05$  as significantly more stressful than did males. No other effects reached significance.

In summary, the children demonstrated more variable heart rate patterns during testimony in the courtroom than in the private room, indicative of a stress response. Children questioned in court also identified confusion about what they were supposed to do in court as significantly more stressful than did children questioned in the private room. These findings highlight the need for preparation programs that reduce anxiety and demystify the legal process. However, there was no evidence from overall self-report scores of anticipatory anxiety that children expecting to testify in court were more anxious generally about the experience. Girls, however, identified several aspects of the courtroom context as more stressful than did boys—specifically, being asked embarrassing questions and being asked questions in front of someone who had hurt them.

**Effects of anxiety on memory**

Although children questioned in court demonstrated poorer memory and heightened anxiety, exploratory analyses using Pearson product-moment correlations failed to reveal evidence for the notion that greater anxiety in the form of heart rate variability was responsible for constricted memory performance on free recall. However, there was a significant negative relationship between heart rate reactivity and correct responses to the 60 specific questions,  $r = -.27, p < .01$ . The more variable children's heart rate reactivity indices were, the less frequently they responded correctly to specific questions.

**Legal knowledge and past court experience**

Exploratory analyses were conducted to examine the relationships among legal knowledge, past court experience, recall, and anxiety. Pearson product-moment correlations revealed a significant correlation between legal knowledge and correct free recall,  $r = .40, p < .0005$ , and legal knowledge and errors in free recall,  $r = .25, p < .05$ . A significant positive relationship also emerged between legal knowledge and correct responses to specific questions,  $r = .28, p < .05$ . A negative relationship was revealed between legal knowledge and "I don't know" responses to specific questions,  $r = -.26, p < .05$ . Hence, greater legal knowledge was associated with greater

productivity in free recall and fewer “I don’t know” responses to specific questions.

In examining the relationship of past court experience to memory, Pearson product-moment correlations revealed a significant positive correlation between court experience and correct free recall,  $r = .36, p < .005$ , and a significant negative relationship between court experience and “I don’t know” responses to specific questions,  $r = -.25, p < .05$ . Hence exposure was associated with better memory performance.

Neither legal knowledge nor past court experience was related to lowered anxiety, either before or during mock testimony. Hence there was no evidence that legal knowledge and past court experience, representing greater understanding of the legal process and familiarity with the setting, decreased anxiety in this paradigm. Still, there was evidence to support the notion that greater understanding of and exposure to the legal process facilitates productivity on the stand. Children with greater understanding and exposure use the “I don’t know” response less frequently, report more information in free recall, and provide more correct responses to specific questions. Since there is no evidence that lowered anxiety is responsible, it is possible that greater understanding of the legal system reduces confusion and disorganization directly, improving variables such as effort and motivation that lead to greater productivity.

**Self-perception and social support**

In exploring the role of self-perception and perceived social support as mediators of the relationship between anxiety and memory, Pearson product-moment correlations revealed a significant negative relationship between self-perception and anticipatory anxiety as reported on the STAIC (Form C-1),  $r = -.34, p < .01$ , and perceived social support and anticipatory anxiety,  $r = -.26, p < .02$ . Thus the greater a child’s self-perception and perceived social support, the less anticipatory anxiety the child reported. Perceived social support was also

positively correlated with correct responses to specific questions,  $r = .23$ ,  $p < .05$ . The stronger children perceived their social support network to be, the more frequently they responded correctly to specific questions. In sum, the greater children's self-perception and perceived social support, the less the anticipatory anxiety they reported and the more often they responded correctly to specific questions.

### Children's perceptions of the interview

In order to understand children's perceptions of the paradigm and check its efficacy, children rated various aspects of the interview, their own performance, and the interviewer. As a group, mean ratings suggest that children rated the questions at medium difficulty and their own performances fair to good. They thought the questioner was relatively nice, and that he liked them a little and believed some to most of what they reported. As a group, children reported themselves as brave, not nervous.

Children's ratings did not differ dramatically as a function of setting. However, it is interesting to note that 27% of children in court rated themselves as scared or very scared in comparison with 17.5% in the private room. Children in court perceived the questioner as significantly less nice than did children interviewed in the private room,  $p < .0153$ . In addition, children in court rated themselves higher on a scale of embarrassment in comparison with children in the non-court setting,  $p < .05$ . When asked how scared and nervous they were, children's responses revealed a significant gender effect, with females reporting more anxiety than males,  $F = 13.96$ ,  $p < .0005$ .

## Discussion

Was children's testimony promoted, impaired, or unaffected by the courtroom environment? In some ways it was impaired and in some ways unaffected. As with past studies, there was no evidence of improved memory performance in the court-

room. Instead, correct free recall was constricted; children interviewed in the courtroom recalled half as many pieces of information as children interviewed in a private room. Moreover, significantly more children interviewed in a courtroom failed to recall the past event at all in response to free-recall instructions, in comparison with children interviewed in a private room showing a similar difficulty. Responses to direct questions unrelated to abuse were also impaired, with fewer correct responses in the courtroom, but court was not associated with increased errors, and questions about abuse-related issues and misleading questions were unaffected by the setting.

In addition, girls' memory performance may be more affected by the courtroom context than boys'. Girls questioned in court declared lack of knowledge ("I don't know") and/or lack of memory ("I can't remember") in response to specific questions more frequently than boys in court or than children in the private room.

Did children experience courtroom testimony as stressful? In this study, children interviewed in a courtroom environment demonstrated significantly greater heart rate variability than children interviewed in the private room. Such heart rate variability has been associated with stress and agitation in other studies.<sup>32</sup> In contrast, self-report measures of anxiety were unaffected by the courtroom context. This outcome was not wholly unexpected. Discrepancies in physiological data and self-report data are not uncommon in this literature. One reason is that both children and adults may not admit to feelings they are experiencing if they perceive the feelings to be socially undesirable.<sup>33</sup> Another explanation is the fact that we did not create the complexities of a real trial nor the feeling states of an actual victim-witness. In actual cases, stress responses may be even greater. It is possible that a certain threshold of anxiety must be reached before self-report is affected. Although sufficient anxiety may have been created to interfere with heart rate patterns, it was not sufficient for



the experience of stress to reach conscious awareness and verbal report. Past findings of greater anticipatory anxiety among children expecting to testify in court are complemented by our findings of greater heart rate variability during mock testimony in court.<sup>34</sup>

Traditionally, the physical and psycho-social context of the courtroom is assumed to promote a complete and accurate telling of the truth. This may not be the case when the witness is a child. Our findings of memory impairment and heightened anxiety in court as compared with those in a private room highlight the need to develop innovative methods for reducing child witnesses' stress and enhancing their memory performance. Innovative techniques that teach children to jog their memory even in aversive environments, and questioning methods that aid children in retrieving details, should be beneficial in promoting more complete and accurate testimony from children. Recent studies have shown promising results using memory enhancement strategies derived from the laboratories of developmental psychology.<sup>35</sup> The present findings, as well as those of past studies, also highlight the need for anxiety reduction that is often the focus of clinical intervention preparing children for court. Perhaps stress-inoculation training methods such as self-statements, and relaxation techniques such as deep-breathing exercises, could be adapted and studied in the legal context.<sup>36</sup>

In addition, these data provide support for continuing the study of courtroom modifications designed to create a greater opportunity for maximal performance on the stand. Our findings lend limited support to the practice of testimony via closed circuit television from a room outside the court; the private room was associated with better memory and less stress. However, it has been reported that although testifying via closed circuit television can produce more complete and accurate testimony in children, jurors tend to believe live testimony more than testimony heard via closed circuit televi-

sion.<sup>37</sup> Hence the cost–benefit analysis of this issue must be conducted in a larger context.

These data also shed light on some of the inconsistencies between courtroom testimony and out-of-court statements commonly noted in children's reports. The results suggest that one source of inconsistency in children's statements is due to variations in the environment in which questioning occurs. Perhaps more complete and detailed reports are to be expected in the statements gathered from interviews held in familiar, private, informal settings than from testimony offered in the courtroom. If replicated with a more powerful manipulation of court-related stress, the results could confirm that children's reports should be expected to vary as a function of setting, not necessarily of honesty. Contrary to these results, several clinical tools for assessing allegations of child abuse cite inconsistency as a criterion indicative of false allegations.<sup>38</sup> Moreover, studies suggest that jurors believe inconsistency affects witness credibility.<sup>39</sup> In light of the results of this study, the practice of equating children's reliability with consistency across settings should be reevaluated.

In addition to greater heart rate reactivity, children questioned in court rated the confusion associated with not knowing what to do in court as significantly more stressful than children interviewed in the private room. This finding supports the notion that preparation efforts to demystify the legal system are needed. More children questioned in court rated themselves as embarrassed and scared or very scared after questioning in comparison with children questioned in the private room. Girls produced significantly higher ratings of court-related stress before questioning than did boys. Specifically, girls identified two task demands as significantly more stressful than did boys: answering embarrassing questions and answering questions in front of someone who hurt them. On the one hand, girls may be in greater need of anxiety-reduction techniques. On the other hand, gender effects were

found on self-report measures, not heart rate reactivity; boys may be in as great need as girls, but they are less likely to admit to feelings that they perceive to violate gender-based stereotypes. This explanation, however, cannot account for the girls' increased use of the "I don't know" response in court but not in the private room, demonstrating a memory difficulty worthy of further investigation.

A number of exploratory analyses were undertaken to examine whether anxiety was the source of children's memory impairment in the courtroom. For the children in this study, there was no evidence that heart rate reactivity was associated with free-recall impairment. However, there was a significant negative correlation between correct responses to specific questions and heart rate reactivity that deserves further exploration.

The fact that children demonstrated restricted memory and heightened anxiety in the courtroom context as compared with age-mates questioned in a private room compels us to consider memory improvement and anxiety reduction as two perhaps independent but equally important goals. Interventions that reduce stress are useful because we strive to minimize unnecessary system-induced stress on child witnesses generally. Similarly, interventions that improve memory performance on the stand should further the course of justice in several directions. We conducted a number of exploratory analyses to aid in developing a research agenda that guides legal reforms and preparation programs in the pursuit of these two goals.

Although there was no direct evidence in our data set to support the notion that legal knowledge and past court experience lower anxiety, there was a positive relationship between these two variables and memory performance. The more legal knowledge children possessed, the more detailed information they provided, the greater the number of specific questions they answered correctly, and the fewer times they responded

with “I don’t know/I don’t remember.” Similarly, the greater the number of past court experiences children had engaged in, the more correct information they reported during free recall and the fewer times they responded to questions with lack of knowledge or memory. Perhaps children with greater exposure to the legal process are more comfortable speaking freely when questioned. Hence there is support for continued educational efforts to increase children’s knowledge of the legal system and exposure to facilitate desensitization, as a means of promoting the quality of children’s testimony. It is possible that some third variable, such as intelligence, could be responsible for the relationship between legal knowledge and memory performance. However, scores on the WRAML, a standardized measure correlated with intellectual ability, were not correlated with legal knowledge or memory performance in this sample.

Our results are similar to those reported by others,<sup>40</sup> who found a significant positive relationship in legal knowledge and correct responses to specific questions. Rather than decrease anxiety, these variables may decrease distraction and confusion, freeing attentional resources, effort, and motivation to serve memory demands directly. Perhaps greater mental resources are then available for the generation and utilization of retrieval strategies.

In terms of identifying specific goals of preparation, confusion regarding what to do in court was the one courtroom characteristic on which there were differences in stress as a function of context. This finding, in combination with correlational findings relating legal knowledge and past court experience with better memory performance, supports the value of preparation programs that strive to demystify the legal process, even if lowered anxiety has not been documented as the causal agent. Given that we did not create high levels of stress and that self-report measures may be insensitive, these data cannot rule out the possibility that other task demands and setting characteristics would be anxiety-provok-

ing to genuine child witnesses. Studies that vary separate components of the courtroom experience (e.g., familiarity, formality, presence of support persons or spectators) may provide further instruction to creators of preparation programs and to policy makers considering innovative legal reforms. For example, if studies show that the quality of children's evidence varies with the presence of spectators, in interaction with individual differences among children, then guidelines for closing the courtroom to spectators could be developed.

In the present study, a significant negative relationship was found between self-perception and anticipatory anxiety. Moreover, this same inverse relationship was found between social support and anticipatory anxiety. Thus the greater a child's self-perception and perceived social support, the less the anticipatory anxiety the child reported. These findings are consistent with others that emphasize the importance of social support as a moderator between stressful life events and mental health.<sup>41</sup> Studies are needed to explore these potentially moderating variables in the legal context. Results could prove influential in developing preparation programs that focus on promoting children's self-confidence and on developing legal reforms that promote social support, such as allowing support persons to be present during children's testimony and, if these adults are witnesses, to offer their own testimony first.

As a society, we have a responsibility to create an environment that maximizes the completeness and accuracy of children's testimony and minimizes the stress placed on children in the process. Our hope is that expanded theories and further research regarding the influence of context and emotion on children's memory will provide direction for the implementation of reforms that enhance discovering the truth and safeguarding the well-being of both children and adults.

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