WITNESS TESTIMONY: THE COMMUNICATION OF REMEMBERED INFORMATION

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ABSTRACT

WITNESS TESTIMONY: THE COMMUNICATION
OF REMEMBERED INFORMATION

By

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The legal system relies on many sources of information to ascertain fact. One important source is the eyewitness. The eyewitness provides information through the structure of the rules of evidence. The rules of evidence define who is capable of testifying, how questions may be asked of the witness, what statements of the witness are relevant, etc. Underlying the rules are psychosocial assumptions made about the eyewitness.

The literature of psychosocial critiques focuses on three important abilities of the eyewitness: observation, retention, and articulation. Although observation and articulation studies indicate weaknesses in these respective functions, the legal system cannot improve upon eyewitness capabilities without introducing fundamental changes. Alternately, retention abilities are under the direct control of the system through the deposition procedure.

Retention studies provide lengthy albeit incomplete data on witness retention. In studies for legal critiques which attempt to closely parallel witness functions, little control over the retention interval is provided. Psychological studies do provide greater control of the retention interval but an important concern of generalizability must be faced.

From the psychological studies on retention, three hypotheses are forwarded about the witness. These hypotheses examine decay and distortion of relevant witness information as a function of retention interval and camera distractions. The experiment is designed to test the relationships under restrictions of time control and external validity.

The design requires subjects to witness an event and respond to a battery of recognition and recall items at a designated time. The examination environment of the subjects parallels the deposition environment excluding the camera distraction condition.

The subject responses are recorded on magnetic tape. Trained coders analyze the responses under a variety of tests. The tests include information quality, mental accuracy, response quality, and some basic measures of response content. Each test is conducted on each subject response.

The first hypothesis states that as the retention interval increases, relevant witness information decays. An analysis of variance found that decay is significant at the .001 level. Hence, the results suggest that the witness does lose information as theories of memory would suggest. From the tests conducted, subjects could give 60 percent recall approximately two to twenty minutes after observing the stimulus, while at two or four weeks, recall was down to less than 40 percent.

The second hypothesis states that as the retention interval increases, witness testimonial distortion increases. Again an analysis of variance of the data finds that witness distortion increase over time is significant at the .012 level suggesting that witnesses progressively distort their recollections of relevant past events. At the immediate condition, 19 percent of the information is distorted whereas at two or four weeks distortion was up to 30 percent of the total information.

Finally the third hypothesis states that as the retention interval increases, the hindering effects on total testimony by camera increase. Hindering effects are operationalized in two ways: by witness response quality decay and by response rate increase. An analysis of variance using the witness response quality decay gave a significance level of .999. Hence, the camera had

no effect on the way in which the witness responded. The second operationalization gave results contradictory to the hypothesis. The camera facilitated the rate of response and the facilitation was found to be significant at the .012 level.

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CHAPTER I

RESEARCH PROBLEM

Introduction

Recent publications question assumptions of eyewitness accuracy in testimony. Buckhout (1974), in a review of relevant literature, points out that subject error may cast doubts on eyewitness reliability reports.

Eyewitness testimony provides an important information base for many judicial proceedings. If the information is suspect, the error potential in proceedings is greatly enhanced and questions of justice may follow.

The purpose of this study is to examine the functions of the eyewitness. Specifically, eyewitness memory functions are examined. This study tests hypotheses of witness information stability and integrity over time.

As this study looks at a well-defined role, the research design must conform to the restrictions imposed by the system. Eyewitness roles are found in the rules of testimonial evidence. Assumptions of witness capabilities are derived from the rules and are identified in this chapter.

Next, a review of literature on previous empirical critiques of testimonial evidence is presented. It

focuses on the examination of the witness functions of observation, recollection, and articulation. The studies begin in the late 1800's and sporadically continue to the present. A representative literature is given.

The weaknesses of the witness qualification of recollection are examined in a theoretical framework. The witness recollection limitations of forgetting, assimilation, and retrieval are examined in a communication/information-processing mode. From research on these areas three hypotheses are proposed. Limitations of the previous research are given as part of a rationale for the present research to test these hypotheses.

Theory of Law on Testimonial Evidence

A popular view of the U.S. judiciary system is that the adversary arena exists to ascertain truth so that justice may be rendered. Steinberg (1957) contends that the American common-law system of jurisprudence best discerns truth when partisan adversaries battle each other for victory. When the eyewitness is involved, truth is arrived at from testimony.

It is through the testimony that participants reason to conclusions for a verdict. Wigmore (1935) suggests that the search and use for testimony is facilitated by the rules of evidence. These rules provide the necessary structure for the proceedings.

The structured notion of testimony is not universal. The Romanesque system (complementary to the American) permits the witness the freedom to explain the event in his own way (Weinstein, 1957).

Rules of evidence: an overview.--The American law system relies on an elaborate network of evidence rules (Wigmore, 1935). The network was developed as a reaction to the use of the jury system. It was thought that protection against irrelevancies, biases, or fraudulent testimony was required to prevent jurors from being misled (Wigmore, 1935).

Rules of evidence, then, provide the judicial system with criteria on which to oversee witness testimony. The rules pragmatically attempt to maximize the law's resources for the procurement of truth (Weinstein, 1957).

A quantification of the rules is presented in Wigmore's Code of Evidence (1942). Categories of qualification, impeachment, testimonial rehabilitation, and parties' admission provide the basis for testimonial rules. Legal assessments of the witness' communication of remembered information are found in specific witness qualifications of observation, narration, and recollection.

Rules of evidence and psychosocial research.--The "pragmatic" attempts to maximize witness capabilities were

seldom based on empirical studies. Wigmore's Code of Evidence, first published in 1910, neglected research findings presented in On the Witness Stand (Munsterberg, 1908). The legal community also showed little interest in Hutchins and Slesinger's (1928) review of literature that seriously questioned assumed witness capabilities.

Although there has been a small but continuous flow of research on the psychology of the witness (Morris and Fishman, 1957), the rules of evidence appear to be impervious to change. Comparing The Revised Rules of Evidence (U.S. Congress, House Special Subcommittee on the Reform of Criminal Laws, 1973) to Wigmore's Code of Evidence (1942) shows little change in underlying assumptions on eyewitness capabilities.

The neglect of response to psychosocial critiques has been attributed to external validity problems of the research. It is argued that with lawyers seldom consulted on witness-related research (Weinstein, 1957), behavioral scientists don't have the means to properly design studies.

Summarizing, rules of evidence were created in response to the need of controlling the witness from confusing the jurors. The rules were based on common-knowledge assumptions of human capabilities. Social science research has tested various assumptions and found them to be of questionable applicability. The legal

community's response to these data has been less than favorable.

The next section examines specific assumptions on witness abilities as found in the rules of evidence. Corresponding research findings are given and compared to the assumptions. Finally, for each category of assumptions, the witness function is examined to see if manipulation of the legal structure could improve witness abilities.

Rules of Evidence: Witness Qualifications

Observation

Several qualifications of witness observation are indicated in the rules of evidence. If the observation is arrived at through personal observation by rational means, then it is assumed that the observation is valid. "Rational" means may include impressions, and negative knowledge, i.e., testimony in denial (Wigmore, 1942). Physical presence is the necessary and sufficient condition for personal observation.

Credibility of witness' observation can be brought to question by an examination of sanity, reputation, and presence during the event (Wigmore, 1942). In other words, impeachment is arrived at by demonstrating that the witness is biased, of bad character, or of strong disposition for lying (Tierney, 1970).

If it can be shown that the witness of sufficient character and intellectual stability is proximate to the

occurrence, eyewitness requirements of the rules are satisfied.

Research findings suggest alternate criteria may be of equal or greater importance. Whipple (1917) in review of European findings about witness functions found that the exactness of the observation depends not only on personal aspects of the witness (physical and mental condition), but also on spacial and temporal conditions above and beyond proximity.

Specifically, Gardener (1933) found that size perception of objects is distorted when those objects are placed with objects distorted in size. Gardener also finds that the perception of velocity is subject to much distortion.

Emotionally distorting factors are also seen to cause difficulty in the observation function. Munsterberg (1923) reports that those most upset by a staged incident involving a shooting were least accurate. Those less emotionally involved had a much clearer perception of the situation.

This research suggests that the rules of evidence are insufficient to guard against observational limitations. The rules do not address the fact that reality may be distorted externally by perceptual ambiguity or internally by emotional stress. In actuality, rules of evidence take a contrary view to stress. Stress, according

to the rules, facilitates information processing rather than impairs it.

The question of applicability of research on observational limitations is an important concern. The structure of the legal system is almost totally independent of the eyewitness observation. Especially when the observation is spontaneous, the eyewitness function is situation specific and although perceptual difficulties may very well hinder observation, little can be done through the manipulation of the system.

Narration

The witness function requires narration of what has been observed. The rules of evidence take into account the three ways the communication may take place: free narration, direct examination, and cross-examination. These ways describe the means by which the encoding process may be stimulated.

The rules of evidence declare that the witness, through proper memory stimulation, can effectively communicate the necessary information to the judge and jury; if not through free narration and direct examination, then through cross-examination: parsing out fact from fiction.

The assumption is that if the memory has been stimulated by any means, the witness will provide useful information. However, the rules of evidence stipulate that the wintess' testimony will not include opinion

(Wigmore, 1942). This rule assumes that either the witness can separate inference from fact, or if opinion is given, it will be perceived as such by the opposing counsel and objected to accordingly.

Central to the theme of narration is the importance of cross-examination where the witness gets a true test of his knowledge. Contradictory findings by Marston (1924) indicate that the direct examination approach is more complete and accurate than the cross-examination. Jones (1969) also finds that the best method of interrogation is the directive nonevaluative questioning (the direct examination).

It is also assumed that manipulative questions are easily recognized by the opposition. Loftus and Zanni (1975) find that subtle manipulations of wording of a question put to a person about a recently witnessed event can affect a person's answers to that question.

Finally, research data suggest that narration is a function of witness' verbal abilities (not independent of them as the rules would suggest). Marshall (1966) finds that the more education the subject has, the more verbal the response. Whipple (1917), in review of European literature, finds that correctness of report of the observation depends on a facility with words and the number of times the testimony was given.

Rules of evidence develop an elaborate structure of examination procedures but fail to accurately assess the witness' capabilities of narration. Contrary to rules assumptions, direct examination is found to be superior to cross-examination. Further, the rules of cross-examination developed to safeguard against witness manipulation are ineffective in dealing with subtle manipulations by the proficient examiner.

Research also shows weaknesses in the opinion rule. Opinion, the subject evaluation of the witness, is often very difficult to separate from observed fact. With narration a function of witness abilities, a skillful orator could blend opinion and fact to such an extent that parsing out fact would be almost impossible.

As to system changes, the function of narration, unlike observation, is under control of the legal system. However, changing this part of the rules of evidence would change the entire adversary nature of the American system. From past hesitance by the legal system to incorporate innovation, it is very questionable that suggestions of fundamental change would meet with any support.

Recollection

Several memory assumptions are made in the rules of evidence about qualifications of witness' recollection. Memory is assumed to be a faculty. Any recollection, including circumstances unconnected with the case, is

subject to scrutiny. An examination of this sort is common and acceptable practice to measure the witness' capacity for memory (Wigmore, 1935). If it can be shown through any test of memory, no matter how irrelevant to the case, that there is some faultiness in a particular memory, then all memories of the witness become suspect.

A further assumption about memory is that it may lie dormant but can be refreshed or stimulated for recollection. Refreshing takes place when the memory is jogged into recall by any stimulus, relevant or irrelevant to the case. Stimulation of the witness to nervous excitement is assumed to produce spontaneous and sincere responses (Wigmore, 1942).

The rules assume that memory functions independently of whatever caused the memory to be refreshed and the chain of associations that follow, though previously forgotten, will lead to the appropriate memory (Hutchins and Slesinger, 1928).

Rules of evidence also make assumptions about the manipulation of the memory. Due to the adversarial nature of the proceedings, the legal system provides safeguards against memory manipulations by either side. One rule specifically prohibits partisan suggestions or instruction before the case comes to court (Wigmore, 1942). However, explorations of stories by witness-attorney

interactions prior to the trial are both permissible and common (Weinstein, 1957).

As previously noted, misleading or intimidating questions are not permissible in that the witness' memory could be misled. Misleading questions are defined as questions implying testimony of unfavorable matters not yet admitted by the witness. Intimidating questions are those which seek to disconcert the witness to make the testimony appear less trustworthy through confusion.

Beyond these manipulations of the partisan adversaries, few, if any, limitations are placed on random or other external distortions. The rules assume that if no manipulations were attempted by the interested parties, the memory may decay but not distort.

Research into witness functions again arrives at contradictory findings. Memory, as a faculty, should be able to be developed. Slight (1911), in a related study, found that practicing the learning of one set of syllables in no way improved the ability to memorize in other cases. Psychology long ago abandoned the notion of memory as a faculty due to lack of empirical justification.

Memory manipulation within the legal process is assumed to be only in danger when adversaries attempt to manipulate. Other influences lack importance. Bird (1927) found that if a distorted account was provided to the witness after the event, the witness would distort

his testimony accordingly. Loftus (1975) in a similar procedure could manipulate the memorial representations by introducing new knowledge through the use of leading questions given immediately after an event.

The recollection procedure also requires that only facts (not inferences) will be provided. Marshall (1966) found that when subjects were asked to make recollections, they made a great number of inferences to the number of correctly recalled items, with ratios ranging from 40 percent to 70 percent.

The rules of evidence make several unsubstantiated assumptions about witness recollection. The assumption of memory as a faculty has long ago been abandoned with the notion of refreshment by psychology. The rules neglect memory manipulation by anything other than the adversaries discounting important albeit random external distorting factors.

Unlike the witness functions of observation and narration where the legal system either cannot or will not change its structure for the potential improvement of witness capabilities, the recollection function is amenable to system manipulation. When the retention interval (time between observation and testimony) is under a great deal of control by the court, it becomes a practical concern to study the effects of time on the quality of testimony.

The issue of retention over time is a central concern of the psychology of memory. As this area presents a great deal of empirical and resultant theoretical work, it is important to identify findings which correspond to witness memory functions.

As testimonial integrity is a key concern, the major focus of the literature review is on memory decay, distortion, and manipulation through distraction. From this literature review, hypotheses on witness retention are generated.

Witness Recollection and the Theory of Memory

The witness can be seen as a source of information. It has been argued that one of the basic purposes of communication is the transmission of information. The sender may rely on several sources of information for latter transmission: externally through immediate sense experience or internally through the mind. The mind may act as a storer of information (memory) or as an initiator of information (ideas). When the communicator acts as a witness, he is required to rely on the mind only for stored information.

Mortensen (1972) identifies this aspect of communication as part of the intrapersonal system. In this conceptualization, primary communication does not exist with the dyadic interaction. Communication may go on

within the individual. The intrapersonal communication is concerned with the memory function.

The intrapersonal system is now examined through theory and empirical findings of psychology on memory. The examination will be limited to two areas of change within the long-term memory: (1) forgetting and (2) reorganization (Posner, 1973) and the process of bringing forth material for recall: retrieval.

Witness Retention: Forgetting

A crucial hindrance to the witness' performance results from forgetting. When information cannot be retrieved, the information has been forgotten. Central to the notion of forgetting is the types of memory stores for information. Broadbent (1958) and Brown (1958) suggest that memory may be broken down into two systems: short-term memory (STM) and long-term memory (LTM). A structural-functional viewpoint would identify them as structural features (Klatzky, 1975). A system approach would identify them as control processes (Atkinson and Shiffrin, 1968).

Keele (1973) presents strong evidence for the identification of two memories. Differences in the systems are suggested through brain injury cases (Corkin, 1968; Shallice and Warrington, 1970). Peterson, Hillner, and Saltzman (1962) present other evidence showing

different effects from spacing and practice. Finally, from studies of Underwood (1965), Kolers (1966), and others, evidence suggests that the nature of the representation of the information differs.

Short-term memory is described by Posner (1973) as the system containing items in the active (conscious) state. Only a few items can be maintained due to a limited capacity. Information may be maintained in the STM indefinitely through rehearsal. However if distractions occur, information is lost within twenty seconds (the unrehearsed duration of the STM) (Keele, 1973). With such limited capacity and duration, this store is of little use to the witness.

The more permanent store for information (the store relied on by the witness) is the long-term memory (LTM). It has been suggested by Posner (1973) that the STM acts as a filter where information is made compatible for long-term storage. Klatzky (1975) suggests that this filtering provides for comprehension: for pattern recognition, sensory register information must be matched with information in the LTM. This process requires a great reduction in information so that the LTM takes in only a fraction of the original perception. In terms of capacity, however, Penfield (1959) and others suggest that every piece of information stored will always remain.

Tulving (1972) suggests that storage may take place in two different ways: semantically (meanings, rules, etc.) or episodically (autobiographical information). The episodic store, the most relevant store for the eyewitness, provides both an acoustic and visual representation (Klatzky, 1975). Episodic storage was found by Atwood (1969) to be most successful when images had an organizational framework. In other words, episodic storage necessitates associations.

Keele (1973), from a study by Reed (1970), notes that abstraction of information in LTM appears to be common to both verbal and visual material. With much of the original input lost, the resultant product greatly economizes processing demands. Long-term memory for both semantic and episodic storage requires associations which make storage of the material possible.

The concept central to long-term storage then is association. LTM, as a network of associated bundles of information, is compatible with S-R theory (Klatzky, 1975) and classical conditioning by paired response (Pavlov, 1927). Many information-processing theorists (Anderson and Bower, 1973; Quillian, 1968; Rumelhart, Lindsay and Norman, 1972) have also adopted association as the best representation for memory (Klatzky, 1975).

The associated bundles, "memory cells" by Posner (1973), are the products of past experience. Slamecka

(1966) finds that these old associations are highly resistant to anything but superficial change. Thus, Adams (1967) and Paivio (1969) find that internal and external perceptual events and the memories they activate are associated together into what Posner and Keele (1968) call the prototype of the central or average tendency of past and present related stimuli.

It is from this framework that long-term forgetting takes place. Previously it was stated that theorists such as Penfield believe that all the information stored in the LTM is still there. Forgetting in the LTM occurs when information is misplaced (not lost). Klatzky (1975) suggests that information in episodic memory becomes easily inaccessible with new information continuously entering.

Ebbinghaus (1913) found that information displacement is systematic over time. It was through his pioneering work in memory loss that the original "curve of forgetting" was surmised. This curve suggests a curvilinear decay of information over time. Replicated findings are indicated in Figure 1.

The "curve of forgetting" is compatible with the previously discussed theories of memory. The transitory nature of the short-term store and the great information reduction from short-term to long-term memory suggests fast decay rate. As the information is associated, it

loses its individual nature and with new information entering, the decay continues but at a less dramatic rate. (For a theoretic derivation of this process, see Appendix A.)

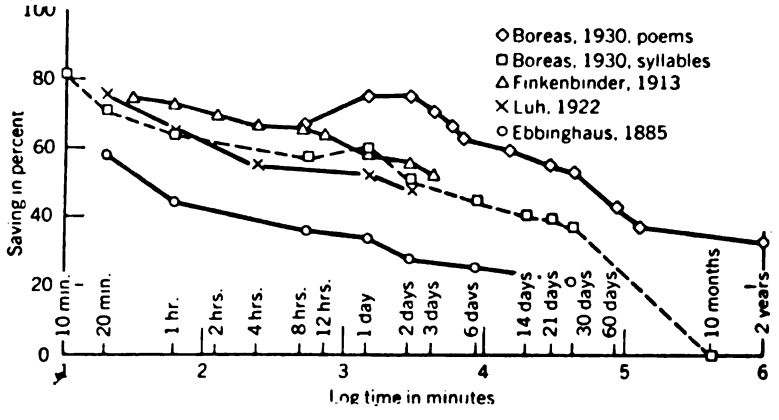


Figure 1.--Retention curves (after Woodworth and Schlosberg, 1961).

Properly functioning in the role, the witness provides testimony through tapping memory of stored information about the event. According to the associative theory of memory, witness information is subject to the same processes as any other information. As the witnessed information is sent to the long-term memory, large quantities of information are lost. The information that does get stored in the LTM is subject to decay through the dynamic process of continual assimilation.

The external validity criticism against the information decay findings by the legal community is, to

a certain extent, shared by psychology theorists. Klatzky (1975) questions the approach of the testing the LTM through the use of long lists of verbal material. It can be argued that remembering lists of words is fundamentally different than remembering human interaction.

To find if the generality holds to witness memory capabilities, this study will test the following hypothesis:

H_1: As the retention interval increases, relevant witness information decays.

Witness Information Distortion

The previous section indicated that forgetting takes place through assimilation. The witness then has only a limited account of the interaction. This limitation leads to a fundamental discrepancy with the witness role. The witness role requires strong mental representations of past witnessed events. In actuality, the mental representation is incomplete. Marshall (1966) contends that this discrepancy is reduced by assimilation to provide a complete picture.

The process of discrepancy reduction is facilitated by the unconscious nature of assimilation. Assimilation goes unnoticed because the memory is spontaneously active and changing (Koffka, 1935). Distortion through assimilation then is the second important limitation to

be considered. Distortion exists when there is any variance of the report to the facts. When the witness provides information which does not correspond to the actual event, the witness is giving a distorted report.

It is suggested that assimilation is subconscious and natural because it plays an integral part on making sense out of the environment. Klatzky (1975) considers learning to be the process of adding to and modifying the memory system. Learning to cope with the environment requires assimilation.

It is found that assimilation takes place in both the semantic and episodic store. Ceraso (1967) finds that delay in the retention interval causes material to lose its separate identity and merge with other information. Posner (1973) suggests that there is an inability to maintain boundaries for learned information.

A study which appears to have a fair amount of external validity is found in the work of Bartlett (1932). Bartlett had subjects read a short essay, "The War of the Ghosts." Subjects gave accounts which tended to rearrange the story into a more normal pattern. It appeared that the mental representation of the story was assimilated into the subject's knowledge structure (Klatzky, 1975).

Summarizing, information is processed and stored in memory through assimilation. Any information is subject to distortion from associations of past experience

as well as any future related associations. As the information bundles develop, they become resistant to change. Associations strengthen and stabilize. (For a theoretic derivation of this process, see Appendix B.)

As noted earlier, the rules of evidence command the witness to only give factual testimony. The theory of memory on association would suggest that this is an impossible task. According to the theory, information can only be stored if it is associated with information bundles. As isolation boundaries are not substantiated in research findings, witnesses cannot accurately maintain the facts free from distortion. As associations continue over time, the witness' information should distort accordingly.

The following hypothesis will be tested to determine the effects of time to witness testimonial distortion:

H_2: As the retention interval increases, witness testimonial distortion increases.

Witness Recollection With Distractions

Finally, when the witness is required to recall information, he must search through his memory and revive (retrieve) the necessary information through the organization (Eagle and Leiter, 1964). Retrieval may be defined as the process of long-term memory activation of

stored information for reorganization and generation of an output (Posner, 1973).

Retrieval may vary from almost automatic responses requiring no conscious effort to responses requiring great effort (sometimes with no results when the information is lost). Effort is most commonly experienced by the TOT (tip-of-the-tongue) phenomenon. TOT research by Brown and McNiel (1966) shows that people go through a systematic search for materials. This search requires both effort and concentration.

When retrieval requires effort, distractions may make the necessary attention for recall difficult, if not impossible. Various studies (Fitts and Seeger, 1953; Fitts and Jones, 1961) have found that retrieval is a function of S-R compatibility. In the case of the witness, the compatibility is between the interrogation question to the witnessed event. With retention interval increases, information assimilation increases and thus the S-R compatibility weakens.

The legal community has shown interest in the use of video tape in testimonial procedures. The use of the camera to take the video portion of the testimony may hamper witness response. The camera may be distracting enough to hinder the retrieval process.

The final hypothesis tests for the effects of the camera as a distraction on witness response:

H_3: As the retention interval increases, the hindering effects on total testimony by camera increase.

CHAPTER II

METHODS AND PROCEDURES

Overview

The experimental design for testing the hypothetical relations was a 2x3 factorial, independent groups design: two conditions of camera/no camera by the three retention interval treatments. The retention interval was trichotomous with an immediate condition, a two-week condition and a four-week condition.

The subjects viewed a video taped marital argument. A deposition of the stimulus was taken immediately or at the appropriate delayed time. When the deposition was taken, approximately half the subjects testified in front of a camera (the camera treatment). The deposition was taken in a classroom devoid of many distractions. After the testimony was given, the subjects were debriefed and then filled out a demographic questionnaire.

The testimony of the subjects was recorded on cassette or video tape. This permanent record of the responses was content analyzed. Each answer, requiring recognition or recall, was processed through a battery of analyses by trained coders.

Independent Variables

Previously it was noted that retention interval was of hypothetically critical importance to testimony. The retention interval, the time between the event and the testimony, was manipulated by increasing the duration between these two occurrences at specified times.

It was also hypothesized that with recall requiring attention, distractions would hinder accounts. An important way distractions can take place is through the use of video cameras for recording the testimony. Video procedures are of great interest to the legal community as a means of expediting the various processes. If, however, the testimony is unduly restrained, the camera is of little benefit.

To test for the effects of camera on the witness, the camera condition was defined operationally as the situation in which the witness is close to (ten feet) and directly in front of the camera. This effect was isolated with the testimony room containing few other distracting features readily visible to the testifying witness.

The Sample

One hundred three subjects were drawn from the greater Lansing area. The subjects were primarily members of various P.T.A. organizations. Ten subjects were

not P.T.A. members. A ten or fifteen dollar donation (depending upon the condition of immediate or delay) was made to the organization. The independents were personally paid. The subjects were randomly assigned to the various conditions. The mean age of the entire sample was thirty-five. Sixty-two percent of the sample was female. Most of the subjects were married.

Procedure

Three rooms were used in the study: the waiting room, the stimulus room, and the testimony room. After arriving, the subjects were told to be seated in the waiting room. When the stimulus was ready, they were escorted to the stimulus room, a classroom with a student capacity of thirty-five. As many as ten and as few as one viewed the stimulus. The following instructions were given:

> Today you will be seeing a marital argument. Please do not be offended by any language used. It is important that realism exists and, let's face it, some people do talk this way when they are angry. For the purpose of this study, pretend that you are the (brother/sister) of the husband. You just dropped in unexpectedly and are able to watch the fight unnoticed.

At this point the subjects viewed the video tape on a monochromatic monitor.

The stimulus involved a marital argument. Walter, a heavy-set man in his forties, comes home at 8:00 in the morning to a waiting wife, Louise. An argument

develops and such topics as money, the baby, and each other's socializing provide the volatile ingredients for Louise to push and hit Walter. The stimulus was presented on video tape to control for variations which would have occurred with repetitive live presentations. (For the transcript, see Appendix C.)

Following the completion of the stimulus, further instructions were given:

> This quarrel proves to be the last straw and your sister-in-law brings charges of assault and battery against her husband. You, of course, are an eyewitness and will be asked to give testimony when called upon.

Immediate report:

> Please return to room 102 (the waiting room). Please do not talk to anyone about what you just saw. After all, it is you and only you who have seen the fight. This is extremely important research and we need to know what <u>you</u> think.

Delay condition:

> (Person organizing the group) will indicate when you should return to complete the study where you will be asked to testify. Please do <u>not</u> talk to anyone who has or will be seeing the tape about this. After all, it is you and only you who have seen the fight. This is extremely important research and we need to know what <u>you</u> think.

The subjects (immediate or returning) then waited until called on to go to the testimony room. The waiting room was a classroom with a student capacity of thirty-five. The stimulus room was a carpeted classroom with a seating capacity of fifty. The stimulus room differs depending on the camera condition. In the "no camera"

condition, the camera, the T.V. monitor, and the VTR were not present. (See Figure 2.)

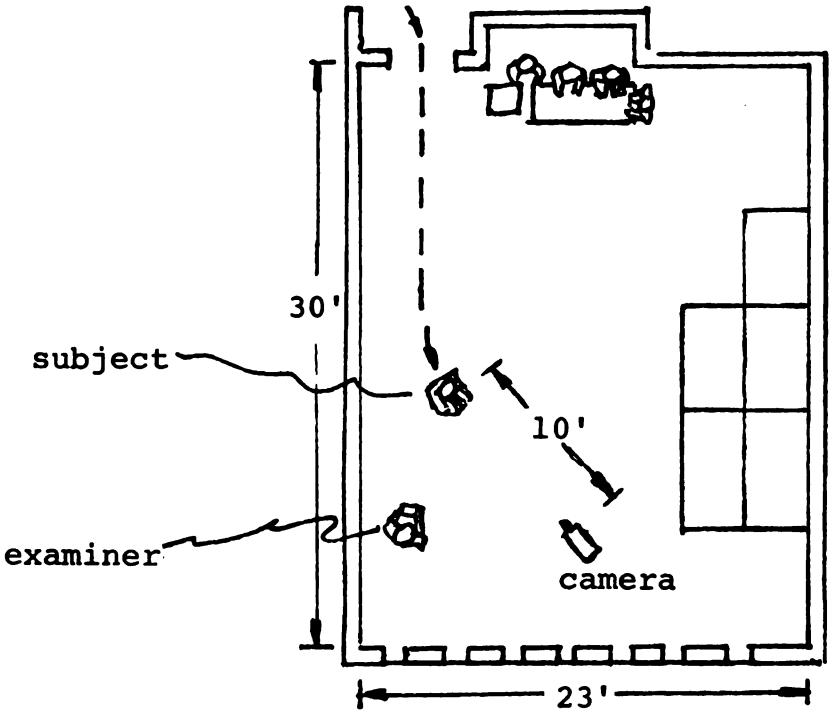


Figure 2.--Schematic of the testimony room.

The testimony room was controlled for other distracting stimuli. The subject entered the room and after passing by four experimental personnel, was seated adjacent to the examiner and the camera (for the camera condition). After the subject sat down, a microphone was placed around the subject's neck. In the camera condition, the examiner informed the subject that s/he was being video taped.

The examiner then proceeded through the examination question and then debriefed the subject. (See Appendix D for the examination questions and the debriefing statement.) The subject returned to the waiting room, filled out a questionnaire, and then was dismissed. (See Appendix E for the questionnaire.)

The Examination Questionnaire

Questions for eliciting eyewitness testimony should be brief and to the point for the procurement of facts (Heller, 1968). Facts of sequence are of primary importance to cases of argument and assault. It is very relevant to find out who spoke or struck first (Marshall, 1966). The questionnaire was designed to determine who said what; or where and when the particular interaction took place. Every attempt was made to keep the examination free from leading questions.

Specific information was ascertained through a sequence of contingent questions. The first question in the set tested for recognition: did the witness have any memory about the occurrence. If the witness failed to respond affirmatively, no other questions of clarification were asked (about unknown facts). If the witness responded affirmatively, open-ended clarifying questions were asked producing recall and/or assimilation.

Dependent Variables: Verbal Response

Retention interval and distracting camera effects were manipulated to test for various differences in testimony. The variety of analyses on the witness report included the total amount of correctly recalled information and the total amount of assimilated information present in the testimony.

All testimony was recorded on cassette tapes or transcribed on cassette tapes from video tape. From this record of the proceedings, coders assessed each answer following the scale description scheme contained in Table 1.

Table 1.--Scale description.

Part A: Information quality
The information quality of the response will be judged on a five-point scale. This Likert scale will look at positive and negative aspects of information. Positive information will be defined as that information which conforms to the actual events. Negative information will be defined as that information that does not conform to the objective events but originates from a different source.

Information quality will be operationally defined in the following manner:

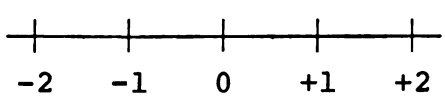


Table 1.--Continued.

Description of the scale points:

-2: a wrong "manufactured" statement having no relation to any part of the stimulus

-1: discussion of an aspect of the stimulus not directly relevant to the question

0: stating a lack of knowledge or no report

+1: a vague but correct assessment of the answer

+2: a strong assessment of the objective facts

Part B: Accuracy of mental ability

Accuracy of mental ability, when positive, will be defined as a true assessment of the mental state as it interacts with objective reality. Inaccurate mental ability is defined as a false assessment of the facts where appropriately no response should have been given.

Accuracy of mental ability is operationally defined the same as information quality except that a statement of lack of knowledge (being a correct or safe assessment) is given a +2.

Part C: Response quality

Response quality will also be judged on a five-point scale. This Likert scale will be used to judge the quality in the response from a low quality response of "one" to a high quality response of "five." Response quality will be defined as those vocal behaviors both verbal and nonverbal which would indicate how the source responds independently of the information conveyed (i.e., the face value).

Response quality will be operationally defined as follows:

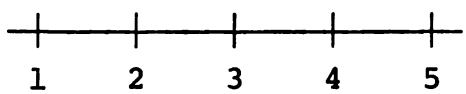


Table 1.--Continued.

+1: low quality of response--long pauses, very unsure, contradictory or statement of lack of knowledge

+2: long pauses, confused, appears to have little confidence

+3: midpoint of quality--exercising caution, choosing words

+4: characteristics of "+5" but not as quick or soft spoken

+5: high quality--strong, domineering, confident, clear, crips, concise, sure, direct, quick to respond

Miscellaneous

Other measures will be given including: the time of response, the number of words used in the response, the number of nonverbal vocal utterances, the number of negative references to the cognitive state, and the number of positive references to the cognitive state.

These measures are operationally defined in the following manner:

The time of response--the number of seconds it takes from the end of the examiner's question until the end of the response by the witness

The number of words used in the response--anything that was said including questions of clarification

The number of nonverbal vocal utterances--any utterances such as "um" or "ah" etc.

The number of negative references to the cognitive state--the total number of times during the testimony where the witness made the statement such as "I don't know" or "I don't remember"

The number of positive references to the cognitive state--the total number of times during the testimony where the witness made statements such as "As I remember" or "I think" etc.

Data Analysis

The dependent variables of witness testimony (relevant eyewitness testimony, witness testimonial distortion, and total disclosed information) were operationalized through previous coder scaling procedures. The source of witness testimonial data is limited to particular questions. Questions testing recognition do not elicit much information. The primary use of these questions was for introduction to questions of recall that test for knowledge specifics. Therefore, only questions eliciting recall were used in the analysis.

Relevant eyewitness testimony (the test of retained knowledge) was determined through a sum of positive scores on code scheme A: "Information Quality." With distortion identified as a type of forgetting, negative scores were recoded to zero for this test.

Witness testimonial distortion (the total amount of learned assimilated information) was found through a sum of negative scores on recall items from code scheme A. With correct information showing no distortion, positive scores were recoded as zero for this test.

Total disclosed information (the "openness" of the witness) was found by the total number of words used in testimony. Tests for memory accessibility may be found through a ratio of the number of words per unit

time and through the coders' evaluation of the quality of the response to recall items (code scheme C).

Hypothesized curvilinear relationships of relevant eyewitness testimony and witness testimonial distortion to retention interval were tested by regression procedures. The correlation and significance level are reported in conjunction with the first two hypotheses.

Analysis of variance procedures were used to test the two-way design (camera by retention interval). The analysis of variance tests were used on each of the three dependent variables. The third hypothesis was also tested through this procedure.

CHAPTER III

RESULTS

Introduction

The results have been divided into three sections. The first section is concerned with the first hypothesis testing for the effects of retention interval on witness information retrieval (forgetting). The second section examines the second hypothesis: the effects of retention interval on distortion. The third section is concerned with the effects of the distracting stimulus of the camera. The hypothesis suggests that witness content is hindered by the effects of the camera and that these effects become more pronounced as the retention interval increases.

Witness Retention: Forgetting

H_1 states that as the retention interval increases, relevant witness information decays. The hypothesis was tested by the measure of the correct information conveyed with respect to the six recall items. With a completely correct item worth two, and distortion or lack of knowledge coded as zero, the scores could range from zero to twelve. The range of scores reported gave a maximum of twelve at the immediate recall condition to a

value of one at the four-week delay condition. A summary of the results is shown in Table 2.

Table 2.--Summary statistics: relevant witness information.

Conditions	Treatment (Retention Interval)		
	1/2 hour	Two Weeks	Four Weeks
No camera	(n=20) $\bar{X}$=7.75 S=1.916 +%=65.0	(n=20) $\bar{X}$=4.35 S=1.725 +%=36.3	(n=12) $\bar{X}$=3.67 S=2.146 +%=30.5
Camera	(n=19) $\bar{X}$=7.65 S=2.43 +%=58.8	(n=14) $\bar{X}$=4.86 S=1.46 +%=40.5	(n=14) $\bar{X}$=4.86 S=2.80 +%=40.4
Both	(n=39) $\bar{X}$=7.41 +%=60.0	(n=34) $\bar{X}$=4.56 +%=38.0	(n=26) $\bar{X}$=4.31 +%=36.0

The decay of witness information over time is evidenced in Figure 3 on means of information retention. An analysis of variance on witness information indicates that the decay is significant in support of the first hypothesis. (See Table 3.) Approximately 33 percent of the variance was explained by the retention interval.

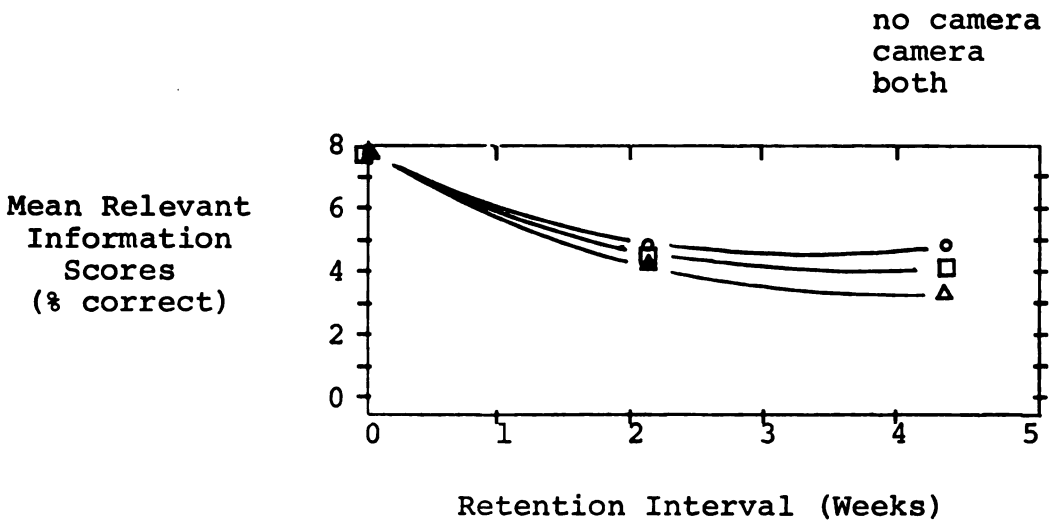


Figure 3.--Information scores vs. retention interval.

Table 3.--ANOVA: relevant witness information (3x2).

Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	209.1	3	69.7	15.68	.001
Time	207.6	2	103.8	23.36	.001
Camera	1.1	1	1.1	.24	.999
Two-way interactions	15.0	2	7.5	1.68	.190
Residual	413.34	93	4.5		
Total	617.4	98	6.5		

Variance explained: $R^2 = .328$.

It is also important to note that with the decay, there was relatively little difference between the two long-term delay conditions at two and at four weeks. By collapsing the retention interval of the long-term delay conditions to immediate/delayed, a two-way interaction of time and camera showed significance at the .09 level. (See Table 4.)

Table 4.--ANOVA: relevant witness information (2x2).

Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	207.99	2	103.99	23.70	.001
Time	206.51	1	206.51	47.10	.001
Camera	.86	1	.86	.20	.999
Two-way interactions	12.58	1	12.58	2.82	.090
Residual	416.84	95	4.39		
Total	637.41	98	6.504		

It has been shown previously that age and sex may influence witness report. To determine the effects of these factors, a multiple regression was run with the inclusion of these two variables. The criterion variable was the relevant witness information. The predictor variables were age, sex, time, and camera. From this

analysis, a regression model was drawn to show the coefficients on the witness information. (See Table 5.)

Table 5.--Multiple regression: relevant witness information.

Variable	B	Std. Error B	F/Significance	Beta
Age	-.0297	.0187	2.52/.116	-.137
Sex	-.621	.458	1.84/.179	-.118
Camera	-.310	.440	.50/.482	.051
Time	-.862	.138	38.76/.000	.543
(Constant)	8.42	.863		

The coefficients give weightings for the four predictor variables. The demographic variables of age and sex showed weights of -.137 and -.188, respectively. The distracting variable "camera" showed a weight of -.061. The only predictor variable of any magnitude was the retention interval (time) with a weight of -.543. (See Figure 4.)

Witness Testimonial Distortion

H_2 states that as the retention interval increases, witness testimonial distortion increases. The hypothesis was tested by the measure of the distorted information conveyed with respect to the six recall items. A completely distorted response (information bearing no resemblance to the stimulus) was worth a -2. Information given

which was relevant to the stimulus but of no applicability to the recall question was worth -1. Other responses (or lack of response) were scored as 0.

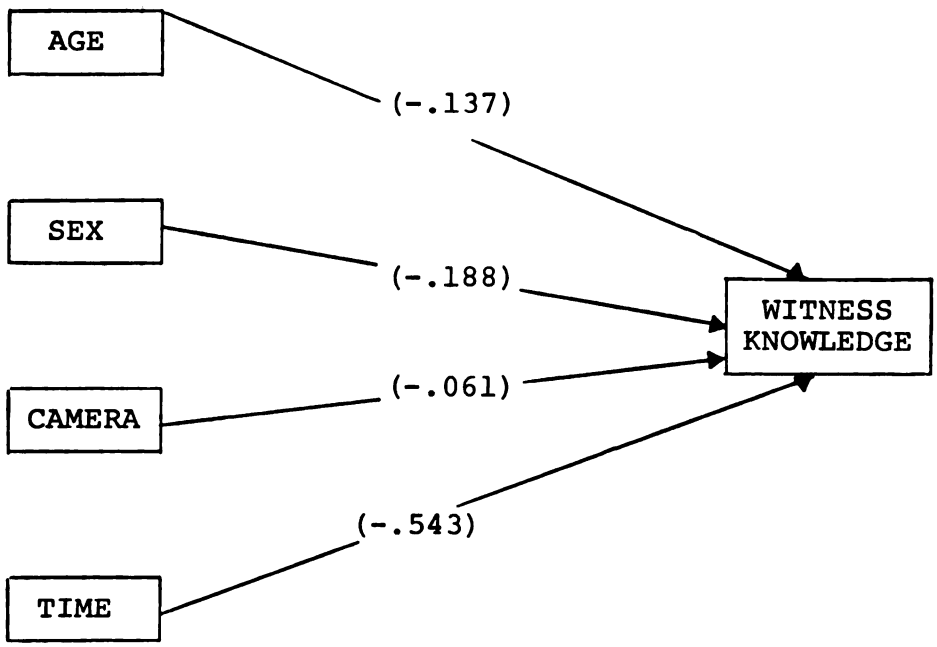


Figure 4.--Regression analysis: relevant witness information.

The scores could range from a minimum of zero (no distortion) to a maximum of -12. The range of scores reported gave a minimum of 0 in the immediate condition, and a maximum of -11 in the four-week delay condition. (See Table 6.)

The increase of witness distortion over time is evidenced in Table 6 of the means. The analysis of variance indicated that the increase was significant at

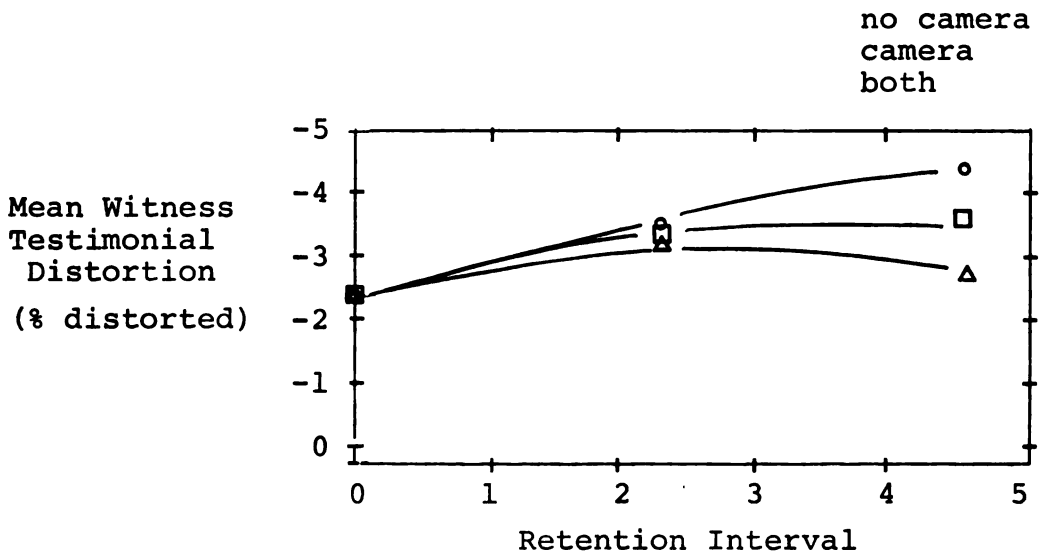


Figure 5.--Information distortion vs. retention interval.

Table 6.--Summary statistics: witness information distortion.

Conditions	Treatment (Retention Interval)		
	1/2 hour	Two Weeks	Four Weeks
No camera	(n=20) $\bar{X}$=-2.35 S= 1.83 -%= 20	(n=20) $\bar{X}$=-3.35 S= 1.73 -%= 28	(n=12) $\bar{X}$=-2.75 S= 1.29 -%= 23
Camera	(n=19) $\bar{X}$=-2.21 S= 2.37 -%= 18	(n=14) $\bar{X}$=-3.71 S= 2.23 -%= 31	(n=14) $\bar{X}$=-4.36 S= 2.53 -%= 36
Both	(n=39) $\bar{X}$=-2.28 -%= 19	(n=34) $\bar{X}$=-3.50 -%= 29	(n=26) $\bar{X}$=-3.62 -%= 30

the .003 level in support of the second hypothesis. (See Table 8.) Approximately 10 percent of the variance was explained by the retention interval.

Table 7.--ANOVA: witness information distortion (3x2).

Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	44.1	3	14.70	3.52	.018
Time	38.6	2	19.30	3.62	.012
Camera	5.91	1	5.92	1.42	.235
Two-way interactions	12.1	2	6.03	1.43	.240
Residual	388.6	93	4.18		
Total	444.7	98	4.54		
	R = .315		R^2 = .099		

Table 8.--ANOVA: witness information distortion (2x2).

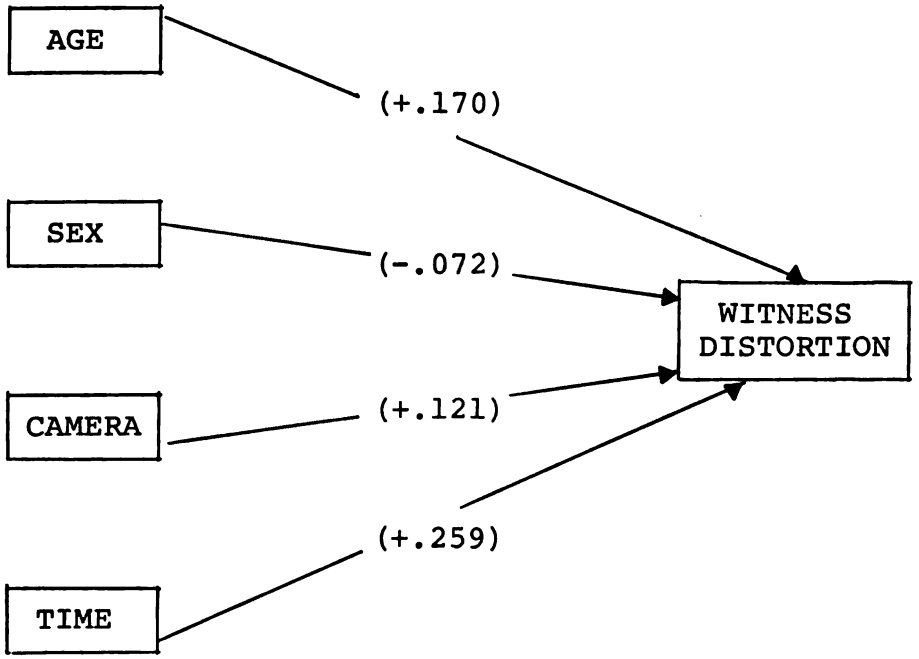
Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	44.072	2	22.00	5.31	.007
Time	38.60	1	38.60	9.30	.003
Camera	6.07	1	6.07	1.46	.227
Two-way interactions	6.50	1	6.50	1.57	.211
Residual	394.2	95	4.15		
Total	444.7	98	4.54		
	R = .315		R^2 = .099		

Again, age and sex have been reported to be factors involved in witness distortion. To determine this effect, a multiple regression was run. The criterion variable was the witness information distortion. The predictor variables were age, sex, time, and camera. (See Table 9.) From this analysis, a regression model was drawn to show the coefficients on the witness information distortion.

Table 9.--Multiple regression: witness information distortion.

Variable	B	Std. Error B	F/Significance	Beta
Age	-.0307	.0176	3.04/.085	-.170
Sex	.3148	.4310	.533/.467	.0718
Camera	-.5157	.4140	1.55/.216	.121
Time	-.3428	.1300	6.92/.010	-.259
(Constant)	-1.3040	.8120		

The coefficients give weightings for the four predictor variables. The demographic variables of age and sex showed weights of +.170 and -.072, respectively. The distracting variable "camera" showed a weight of +.121. The retention interval predictor variable (time) has a stronger weight than any of the other predictor variables, but is much weaker in effect than when used as a predictor for information decay. (See Figure 6.)



Fiture 6.--Regression analysis: witness information distortion.

The Witness and External Distractions: Camera Effects

The final hypothesis tested, H_3, states that as the retention interval increases, the hindering effects on total testimony by camera increase. Hindering effects were operationalized in two ways. The first way examines verbally discernible effects of the witness testimony (quality of witness response). The second way tests for the effects in a more precise (and less noticeable) way through word and time counts, and word/time ratios.

The verbal response was coded on a 0 to 5 scale. The maximum value for the witness would be 100. The

minimum value would be 0, indicating no confidence whatsoever in the response. Range of scores reported gave a minimum of 27 at the four-week camera condition and a maximum score of 98 at the immediate camera condition. That there was no relationship with camera presence or absence of is evidenced by the means in Table 10.

Table 10.--Summary statistics: quality of witness response.

Conditions	Treatment (Retention Interval)		
	1/2 hour	Two Weeks	Four Weeks
No camera	(n=20) $\bar{X}$=72.85 S=16.46	(n=20) $\bar{X}$=53.10 S=13.67	(n=12) $\bar{X}$=55.42 S=17.75
Camera	(n=19) $\bar{X}$=67.95 S=13.30	(n=14) $\bar{X}$=66.29 S=18.31	(n=14) $\bar{X}$=53.95 S=15.83

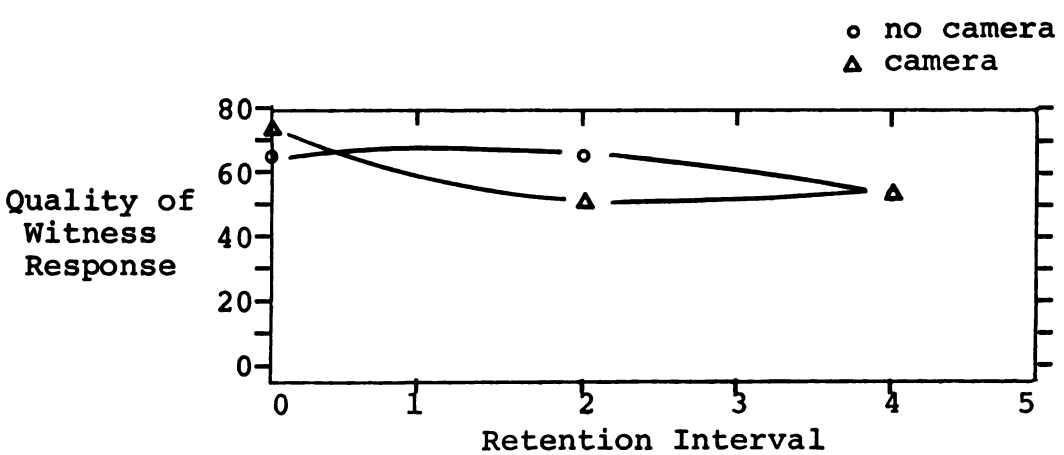


Figure 7.--Quality of witness response vs. retention interval.

Table 11.--ANOVA: quality of witness response.

Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	4722.9	3	1574.30	6.38	.001
Time	4619.6	2	2309.80	9.36	.001
Camera	107.3	1	107.3	.44	.999
Two-way interactions	1573.0	2	786.52	3.19	.045
Residual	22960.0	93	248.88		
Total	29255.9	98	298.53		

Variance explained: R^2 = .161.

Table 12.--Multiple regression: quality of witness response.

Variable	B	Std. Error B	F/Significance	Beta
Age	-.1122	.139	.647/.423	-.0765
Sex	-1.245	3.415	.133/.716	-.0350
Camera	2.316	3.278	.499/.482	.0673
Time	-4.216	1.032	16.700/.000	-.3922
(Constant)	73.240	6.429	129.780/.000	

Age and sex may be factors involved in the quality of witness response. A multiple regression with the criterion variable of testimony quality and predictor variables of age, sex, time, and camera was run. As seen

in Table 12, the only significant predictor variable was time.

The second test requires the analysis of two variables and a ratio of the two creating a rate variable. Witness time was the total time in seconds of all the witness statements. "Witness words" is simply a count of all the words used by the witness. The witness ratio of the number of words per second indicates the rate of response.

Table 13.--Summary statistics: total witness words/time.

Conditions	Treatment (Retention Interval)		
	1/2 hour	Two Weeks	Four Weeks
No camera	$\bar{X}$=193/136 S=65.6/47.8	$\bar{X}$=199/120 S=69.7/50.0	$\bar{X}$=118/91.3 S=58.4/27.4
Camera	$\bar{X}$=193/125 S=95.9/44.2	$\bar{X}$=139/98.1 S=70.5/32.0	$\bar{X}$=157/97 S=57.3/41.7

As indicated in Tables 14 and 15, the time and word variables show decay over time but are not affected by the camera condition. An analysis of variance was run for both and the effect of retention time in witness time and words was significant at the .005 and the .003 levels, respectively.

Table 14.--ANOVA: total witness time.

Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	23577	3	7859	4.29	.007
Time	20736	2	10368	5.66	.005
Camera	2498	1	2498	1.36	.244
Two-way interactions	2733	2	1366	.746	.999
Residuals	170387	93	1832		
Total	196697	98	2007		
	R = .346		R^2 = .120		

Table 15.--ANOVA: total witness words.

Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	70885	3	23628	4.53	.005
Time	67677	2	33839	6.49	.003
Camera	2679	1	2679	.514	.999
Two-way interactions	7318	2	3659	.702	.999
Residual	484674	93	5211		
Total	562851	98	5743		
	R = .355		R^2 = .126		

Caution is advised in examining the variables of witness time and words as they apply to the predictor variables. Both variables are highly dependent on the witness' lack of recognition. A better measure, independent of this, is the rate of recall.

When these variables were combined in a ratio indicating rate of response, the camera and less noticeably the retention interval had an effect. (See Figure 8.) In all three interval treatments, witness response was facilitated by the camera (in contradiction to the third hypothesis). An analysis of variance was run and the camera effect was shown to be significant at the .012 level. A beta value of .263 was found.

Table 16.--Summary statistics: witness word/time ratio.

Conditions	Treatment (Retention Interval)		
	1/2 hour	Two Weeks	Four Weeks
No camera	$\bar{X}$=1.464 S= .362	$\bar{X}$=1.170 S= .299	$\bar{X}$=1.296 S= .458
Camera	$\bar{X}$=1.549 S= .510	$\bar{X}$=1.393 S= .425	$\bar{X}$=1.666 S= .347

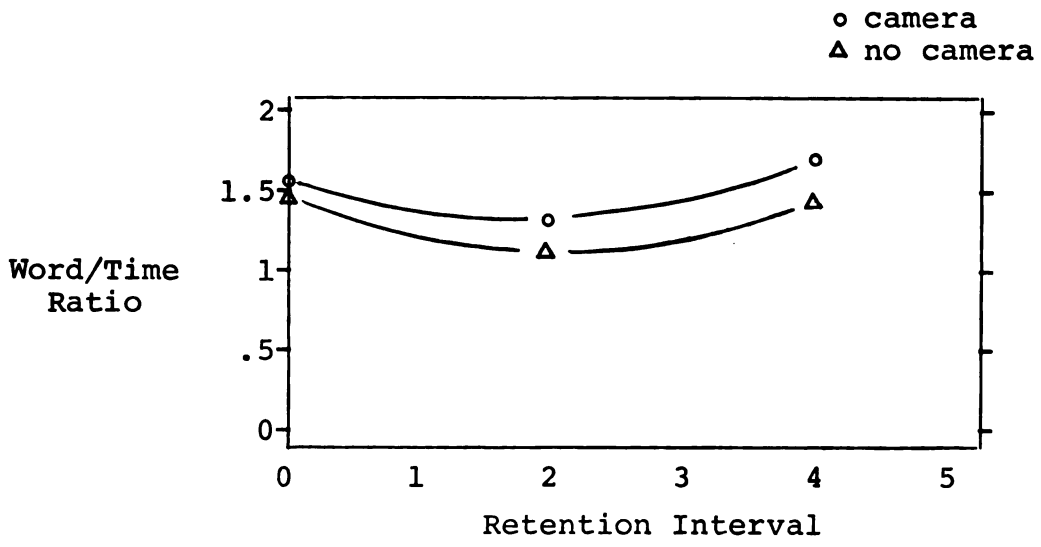


Figure 8.--Word/time ratio vs. retention interval.

Table 17.--ANOVA: witness word/time ratio.

Source of Variation	Sum of Squares	df	Means of Squares	F	Signif. of F
Main effects	].323	3	.774	4.772	.004
Time	1.073	2	.537	3.306	.040
Camera	1.044	1	1.044	6.433	.012
Two-way interaction	.318	2	.159	.981	.999
Residual	15.094	93	.162		
Total	17.735	98	.181		

Variance explained: R^2 = .131.

Table 18.--Multiple regression: witness word/time ratio.

Variable	B	Std. Error B	F/Significance	Beta
Age	-.0013	.00360	.133/.716	-.036
Sex	.0157	.08812	.032/.859	.018
Camera	.2228	.08459	6.93/.010	.263
Time	-.0128	.02662	.230/.633	-.048
(Constant)	1.3730	.16590	68.5/.000	

CHAPTER IV

DISCUSSION

Summary

This study was initiated to investigate various aspects of witness retention. Questions of applicability of previous research needed answers through a study which was more closely directed to actual witness functions. It was hypothesized that the retention interval affected recall in three ways: internally with loss and distortion, and externally with distractions.

Results indicate that the retention interval is a strong determinant of remembered material (especially material relevant to witness testimony). Results from tests of the first two hypotheses provide support for the generalizing assumptions of psychological theory on memory. Results from tests of the last hypothesis show contradictory results (of the retrieval phenomenon) suggesting that the camera may have been something other than a distraction.

Conclusions

Hypothesis 1: Figure 3 illustrates the decay process. A few minutes after observing the stimulus

(immediate recall condition) the average witness response was about 60 percent of the total recall information. At two or four weeks, the average witness response was at 37 percent. This difference was significant at the .001 level. Thus, Hypothesis 1, which predicted decay of witness information over the retention interval, was supported. Further, a multiple regression including predictor variables of age, sex, camera, and time indicated that the variable of time (retention interval) was the only significant cause of witness knowledge decay, explaining about 30 percent of the variance.

Hypothesis 2: Figure 5 shows the distortion growth over time. Almost immediately after the observation of the stimulus, the average witness testimonial response is up to 20 percent distorted. This distortion appears to level out at the delay condition (at two and four weeks) with the mean distortion at about 30 percent. The difference in distortion between the immediate and delayed conditions was significant at the .003 level. Thus Hypothesis 2, which predicted distortion growth of witness testimony with retention interval, was supported.

A multiple regression again including predictor variables of age, sex, camera, and time indicated that the variable of time (retention interval) was the main determinant of witness distortion (with a beta coefficient of .259). The only other variable of apparent

effect was age. With a regression coefficient of .17 at a significance level of .085, age also contributes to distortion in a nontrivial way: the older the witness, the more the witness is prone to distortion.

Hypothesis 3: The final hypothesis testing for camera effects was addressing the issue of aggregate verbal response independent of relevant information conveyed. This concept was operationalized in two ways: through a coder evaluation of the response quality and through the recall rate (words/second).

The first measure indicated that retention interval (and not camera distracting effects) hindered the verbal response. Although the witness with lack of knowledge may supplement testimony with assimilated material, the testimony does not possess the verbal quality that testimony which is fresh in the witness' mind possesses. As to the camera effects, the witness' verbal behavior showed the same general appearance of quality within the appropriate interval.

Results from the second measure of the recall rate (Table 16) indicate that the camera does have an effect on the witness response. In all three retention interval treatments, witness response was faster in the camera condition than with no camera. An analysis of variance was run and the rate difference was significant at the .012 level.

This result contradicts the hypothesized concept of camera hindering effects. The camera seems to facilitate response. For the retention interval delay condition, the difference is almost three times greater than the immediate condition (.056 Δ word/second vs. .157 Δ word/second). Hypothesis 3 requires hindering effects on testimony by camera to increase as the retention interval increases. Over time the response was facilitated.

Discussion

Many contend that the end goal of all court proceedings is to provide justice. When practitioners or critics discover that this goal is difficult or impossible to reach, new goals are established. Several shortcomings provide a strong basis for redefinition of goals where means become ends. The adversary system becomes the end when the strongest attorney can manipulate the witness with greatest dexterity. Ends may also arise from tangential concerns where perceived justice is more important than actual justice.

Limitations of basic legal assumptions and practices may, for the present, deny the realization of justice. However, legal understanding of limitations is incomplete. Experience and common sense, which often provide the main data base for those who define and use the procedural structure, may unnecessarily limit the possibility for innovation. A more sound data base is

provided through social science research. Using such knowledge may clarify the issues so that change will not be counterproductive.

In terms of eyewitness potential, the judicial membership may appreciate some of the most apparent effects of time delay on the witness, but this understanding is at best incomplete and therefore implications are ill-founded. This study supported some basic psychological work on retention. Support for the two hypotheses on retention indicates that witness response is subject to loss and distortion over time. After only two weeks, there is a 30 percent reduction from the average amount in the immediate recall treatment. This, taken with a 50 percent rise in information distortion (from 20 percent to 30 percent), makes the taking of testimony at the earliest time imperative.

It must be added that the witnessing and testifying were staged under favorable conditions. The stimulus was pre-prompted so that all knew they would be asked about the scene. The interactions in the stimulus were comprehensible and straightforward. Instructions following the stimulus were fairly clean of any biasing agents.

Between the stimulus presentation and the testimony, there was no partisan practice of seeing the witness before testimony to thoroughly explore the story. Nonrandom distorting influences by others (besides

the attorney) did not exist as they do in many proceedings.

Although rules of evidence theoretically safeguard the articulation phase of witness testimony, distorting effects are nonetheless present. The experiment, on the other hand, did not have an abundance of these factors. There was comparatively little pressure or emotionalism introduced. Further, the interrogation was free from leading questions (which often occur in direct examinations) and misleading or intimidating questions (which often occur in cross-examinations.)

For all these safeguards against witness trauma, the witness' performance was less than typically attributable to him. After only two weeks, less than half the story was given correctly. The rest of the information (about one-third) is either irrelevant or immaterial. Although the information loss and distortion curves appear to level out, the difference between two weeks and two years may make a substantial difference in testimony. (It is doubtful that the curves ever completely level out.) The taking of testimony at two years appears to be an exercise in futility.

The only major environmental disturbance for the witness was the camera. The camera is seldom used in deposition and trial procedures. This manipulation proves to be of little effect. In terms of information

loss, distortion, and response quality decay, there were no significant differences between the camera and no camera conditions. The only significant difference was found in the response rate. Although this rate may be impossible to differentiate by the listener (the maximum difference of .2 words per second), the difference does exist in all three retention treatments.

With the opposite relationship being found for the camera, its environmental addition appears to result in something other than a response inhibitor. Apparently, the camera brings about a focusing of attention: the witness subconsciously becomes more aware of the situation and the information retrieval mechanisms become more effective.

Research Extension

The present research was highly focused dealing with some of the basic concerns of witness testimony. From a multitude of areas in the rules of evidence relevant for social science research, only the specific witness qualification of witness recollection was examined. Through this examination many issues have been alluded to and, as such, many questions still need to be answered.

Extension of research on witness retention to supplement and complement the present study can address the issues of information for storage, environmental

conditions for the witness, variations of the camera stimulus, and variations on retention interval.

The information for storage (the stimuli data) may be varied along a multitude of dimensions. Central to the notion of association (and therefore memory) is that of familiarity. Unfamiliar events may only be comprehensible if redefined in a different but sensible pattern having marked effects on distortion. Attention to the stimuli is also of theoretical importance to memory. Arousal may be varied along the dimensions of degree and sign. A bland stimulus (low degree of arousal) may be difficult to remember. A positive arousal eliciting empathy or joy may affect the witness quite differently than a negative arousal eliciting anger or disgust.

Closely tied to the event (stimulus) is the environment of the witness. An unfamiliar environment may do much to distract the witness at the time of perception and therefore make retention difficult. The environment at the time of recollection is also important. A deposition taken with an audience of less than a half dozen may facilitate many more responses than a trial situation with an audience of 50 or 100 people.

A new part of the environment of interest was the camera. In this experiment, the camera was isolated to be the only distracting agent. Camera effects on response rate may not be significant when the camera is

one of a multitude of distractions (as in the court room.)

Finally the retention interval, found to be of critical importance, had only three data points. Data at short-term intervals (every hour for four or five hours) and long-term intervals of two, four, and six months would provide important data to better define the hypothetical growth and decay relationships.

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APPENDICES

APPENDIX A

MATHEMATIC DERIVATION: MEMORY DECAY

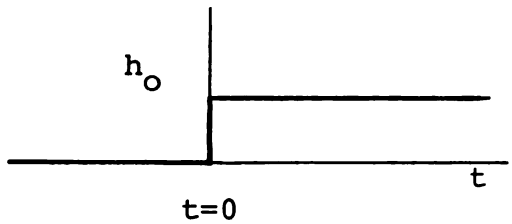
APPENDIX A

MATHEMATIC DERIVATION: MEMORY DECAY

The system: short-term and long-term memory

Initial conditions (at t=0):

$h=h_o$=dimension of new information in the sensory store



(the step input to the STM)

h_oA= "volume" of assimilatable information in the sensory store

A= area of the relevant information bundle

R= resistance to information loss--the ability to process meaningful units into which the sensory information may be transformed

Variables:

h= perceived dimension of new information

q_{in}= incoming (to STM) flow of information

q_{out}= information loss (out of STM and LTM) ("when the information exceeds the amount that can be transformed or rehearsed with later decay" Keele, 1973)

Conservation of information bit flow:

"The rate of information loss (after the step input) equals the rate of decay in stimulus representation over time."

$$q_{out} = -\frac{d(Ah)}{dt} \qquad (1)$$

for A=constant (past associations fairly resistant to change):

$$a_{out} = -A\frac{dh}{dt} \tag{2}$$

Resistance is the potential change (in information) required to cause a unit change in flow:

$$R = \frac{dh}{dq_{out}} \tag{3a}$$

for laminar resistance:

$$R = \frac{h}{q_{out}} \tag{3b}$$

$$q_{out} = \frac{h}{R} \tag{4}$$

Substituting (4) into (2):

$$\frac{h}{R} = -A\frac{dh}{dt} \tag{5}$$

$$\frac{h}{R} + A\frac{dh}{dt} = 0 \tag{6}$$

$$A\frac{dh}{dt} + \frac{h}{R} = 0 \tag{7}$$

divide by A:

$$\frac{dh}{dt} + \frac{1}{RA}h = 0 \tag{8}$$

This is a first order linear homogeneous differential equation and may be solved in the following manner:

$$\text{let} \quad h = ke^{-(1/RA)t} \tag{9}$$

$$\frac{dh}{dt} = 1k\frac{1}{RA}e^{-(1/RA)t} \tag{10}$$

Substitute (9) and (10) into (8):

$$-k\frac{1}{RA}e^{-(1/RA)t} + k\frac{1}{RA}e^{-(1/RA)t} \overset{\checkmark}{=} 0 \qquad (11)$$

$$\therefore\ h = ke^{-(1RA)t} \qquad (12)$$

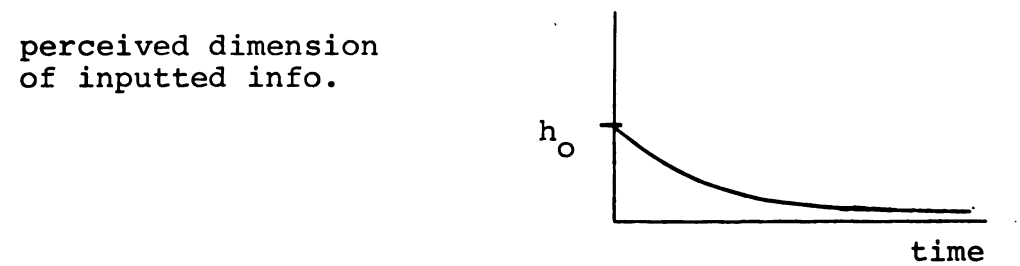
Initial conditions at t=0: $h=h_o$

$$h_o = ke^{(-1/RA)o} \qquad (13)$$

$$h_o = k \qquad (14)$$

Substitute (14) into (12):

$$h = h_o e^{(-1/RA)t}$$



APPENDIX B

MATHEMATIC DERIVATION: MEMORY DISTORTION

APPENDIX B

MATHEMATIC DERIVATION: MEMORY DISTORTION

The system: short-term and long-term memory

Initial conditions (at t=0)

Q_o= the amount of directly related information bits in the bundle of associations

V= volume of the bundle of associations

Variables:

n_i= number of information bits per volume of associated bundle

r_i= rate of assimilation (information associations/ time)

Conservation of information bits of flow in and out of the static control volume system:

"The rate of change of the concept association at time t, (Q'(t)) must equal the rate at which new information enters the associated bundle (R_1) minus the rate at which information leaves the bundle (R_2).

R_1= rate at which new information enters
$= (n_i)(r_i)$

R_2= rate at which information is displaced
$= (Q(t)/V)(r_i)$

Therefore:

$$Q'(t)=R_1-R_2$$

$$Q'(t)=(n_i r_i)-\frac{r_i}{V}\,Q(t)$$

Rearranging the terms:

$$Q'(t)+\frac{r_i}{V}\,Q(t) = n_i r_i$$

This is a first order linear nonhomogeneous differential equation. It may be solved in the following manner:

a. multiply both sides of the equation by $e^{(r_i/V)t}$:

$$(e^{(r_i/V)t})Q'(t) + (e^{r_i/V)t})(\frac{r_i}{V})(Q(t)) = (e^{(r_i/V)t})(n_i r_i)$$

b. note the following relationship

$$[(e^{(r_i/V)t})(Q(t))]' = (e^{(r_i/V)t})Q'(t) + (e^{(r_i/V)t})(\frac{r_i}{V})(Q(t))$$

c. substitute the derivative of the product:

$$[(e^{r_i/V)t})(Q(t))]' = (e^{(r_i/V)t})(n_i r_i)$$

d. integrate

$$(e^{(r_i/V)t})(Q(t)) = (n_i r_i)(\frac{V}{r_i})e^{(r_i/V)t} + C$$

e. divide by $e^{(r_i/V)t}$

$$Q(t) = n_i V + Ce^{-(r_i/V)t}$$

f. determine the value for "C" by examining initial conditions:

$$Q(o) = Q_o \quad \therefore Q_o = n_i V + C$$

g. solve for "C"

$$C = Q_o - n_i V$$

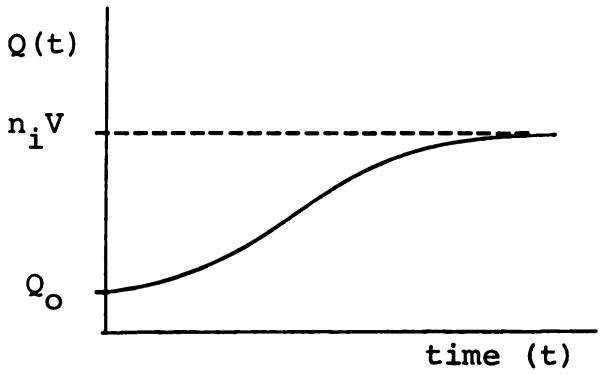
h. substitute "C" into the equation:

$$Q(t) = n_i V + (Q_o - n_i V)e^{-(r_i/V)t}$$

$$Q(t) = n_i V - n_i V e^{-(r_i/V)t} + Q_o e^{-(r_i/V)t}$$

$$\boxed{Q(t) = n_i V(1-e^{-(r_i/V)t}) + Q_o e^{-(r_i/V)t}}$$

conceptualization distortion



APPENDIX C

STIMULUS TRANSCRIPT

APPENDIX C

STIMULUS TRANSCRIPT

Characters:

Walter--white, overweight, middle-aged
Louise--black, thin, middle-aged

Setting: The apartment. Walter walks in at 8:00 in the morning.

Walter: Will you please, Louise. You know what I had to do. I called you yesterday afternoon. These guys came in from the South. This happens all the time. I had to entertain them you understand. I had to entertain them!

Louise: As far as I know lover, Peoria's entertainment goes beddy-bye at 4:00 in the morning.

Walter: Come on Louise. This isn't the first time it's ever happened. You know that! It happens 2 or 3 times a month and it's happened for the last 6 months. The guys come in; they're dealers, huh! I want to entertain them. They want to get wined and dined and laid and everything else and then the next thing I know, I'm in their hotel room for Christ sake until the sun comes up.

Louise: Yeah, yeah, yeah. You always have a story for me.

Walter: What story for God's sake! I keep telling you, you know what it's like! For Christ sake, you'd think a woman would be happier when her husband is trying to get ahead.

Louise: What were they . . . women? You were entertaining some damn honkey?

Walter: No they weren't!

Louise (continues): .....enjoying the fucking evening.

Walter: Cut it out, would you, for Christ sake! Look, calm down. I told you I gave up white meat a long time ago.

Louise: Yeah--bull shit. Who paid the bill, you or the company?

Walter (sitting down): I paid the bill but the company has an expense account that pays me back, so don't worry about it.

Louise (with a newspaper in hand): Well, I have an expense account too but no expense (striking Walter on the head with a newspaper) account.....

Walter: God damn it, cut it out.

Louise (cont'd): In fact, our rent is past due along with some other bills and I just can't cut it.

Walter: All right, you made your God damn point--O.K., you made your point. How much money do you need?

Louise: I need at least a hundred dollars and that won't cover the food bill either.

Walter (interjecting): A hundred dollars? Do you think I'm made of money? You get 50 bucks and that better run the rest of the month.

Louise: Says you Walter--real generous with your friends but the baby and I have got to manage on our own.

Walter: Don't start that "baby" shit 'cause you get out to meet your friends. Don't think so. Don't think you don't.

Louise: Am I supposed to be housebound or something?

Walter: You're not housebound.

Louise: You never take me anywhere. In fact, I'm an embarrassment to you. Isn't that it?

Walter: Hey, now look, cut that crap out. For Christ sake! You get out and get to shaking around with your friends--Look at this pig sty--how you take care of it. Is that what happened? Is that what happened last night Louise? Did you get out with your friends and shake it around a little bit?

Louise: I was at home all night.

Walter: Ah, and that's the reason you see, that's the reason you're mad--because you have to stay here with the brat--huh?

Louise: It's your baby too or have you forgot?

Walter: Oh I can't forget; how in the hell can I forget for Christ sake; you always remind me of it every God damn time.

Louise: Well, you talk like you were forced into it and you weren't.

Walter: Well, listen, if it wasn't for that God damn kid, I wouldn't be here--you know that for sure.

Louise: Look, "A White Knight in Shining Armour."

Walter: Well, this white knight in shining armour wouldn't be here for Christ sake if it wasn't for that kid.

Louise: Well, your love making screwed up my socializing and.... Why don't you just get the fuck out of here. If it wasn't for the baby, I could manage myself.

Walter (interjecting): I don't have to get the fuck out of here. I want to tell you that right now because I pay the bills for this God damn place and that's what you would like, wouldn't it Louise. That's what you'd like--to have me get out so you could have more room, MORE ROOM to play around and then pretty soon we'd have another God damn mouth to feed and I would be told that it's mine.

Louise (throwing the newspaper at Walter and missing): You damn bastard.

Walter: Don't throw that God damn thing.

Louise: Get the fuck out of here.

Walter: I don't have to get the fuck out of here. I'll stay right here.

Louise: This apartment's in my name; I'm calling the cops and get rid of your ass.

Walter: Good, there's the phone; go ahead and call them. You call the cops for Christ sake.

Louise: You're God damn right.

Walter: Who gives a shit whether you call the cops. You think they're going to throw me out of here?

Louise: I hope so 'cause I .....

Walter: They know better for Christ sake--do you think they're dummies? You call the cops. You never had to do that but call them. It's God damn time to get this fucking thing resolved.

Louise (on the phone): Hello, there's a man in my house and I want you to get someone over here right now!

Walter: You see you got me down to talk like that too and I don't like it! You understand?

Louise (giving the address): ..... How soon? Good!

Walter: I'm going to stay right here and wait for them.

Louise: A squad car's in the neighborhood (pushing Walter almost over).
(Walter brings up his arm to Louise but she's faster and pushes him and he stumbles against the couch. He gets up and she starts pounding his chest with her fist.)

Walter (pushing her away): Just cut it out. (They both walk toward each other and push each other away.) What the hell....

Louise: I'm sick and tired of you coming in at 8:00 in the morning. (She grabs his shoulder. He pushes her arm away and moves closer to her. They both grab each other's hands. Louise tries to hit and misses.) I'm really sick of you.

APPENDIX D

EXAMINATION QUESTION AND DEBRIEFING STATEMENT

APPENDIX D

EXAMINATION QUESTION AND DEBRIEFING STATEMENT

Questionnaire

Introduction: You have been called as a witness for the defense. As you recall, Louise has brought charges of assault and battery against Walter. As an eyewitness, you have just been called to the witness stand.

1. First, state your name, address, and occupation.

2. Are you related to Walter?
   Answer: Yes

3. In the morning of question, who spoke first when Walter walked in the door?
   Answer: Walter.

4. What did Walter (or Louise) say?
   Answer: Walter said that he was entertaining out-of-town business associates.

5. Was anything said to indicate that Louise disbelieved Walter's explanation?
   Answer: Yes; if no go to question 8, coding questions 6 & 7 as 0.

6. What exactly was said to so indicate?
   Answer: That Peoria's nighttime entertainment closes at 4:00 a.m.

7. When did you hear that, soon after Walter came in or towards the end of the argument?
   Answer: Soon after Walter came in.

8. Did Louise bring up financial matters?
   Answer: Yes; if no go to question 10 and code question 9 as a 0.

9. What did she say to Walter about their financial situation?
   Answer: That the rent and other bills were due.

10. Did Walter mention Louise's social life?
    Answer: Yes; if no go to question 12 and code question 11 as a 0.

11. What did Walter have to say about Louise?
Answer: That she was out "shaking around" with her friends.

12. Was anything mentioned about the baby?
Answer: Yes; if no go to question 14 and code question 13 as a 0.

13. Who brought up the baby and what did they say?
Answer: Louise brought up the subject and said that the baby was being insufficiently supported.

14. Do you recall Louise striking her husband with a newspaper?
Answer: Yes; if no go to question 20 and code questions 15-19 as 0.

15. How did that occur?
Answer: Physically it occurred behind the couch; verbally it occurred over the money that Walter had spent on his clients/guests and the repayment he was to receive from his expense account.

16. Did Walter retaliate physically?
Answer: No.

17. Did he hit her back?
Answer: No.

18. Did this happen soon after Walter came in?
Answer: Yes--anything up to 1/3 give 2; if 1/2 give 1.

19. Was there an interval between this event and the event which occurred just after Louise called the police?
Answer: Yes.

20. Do you recall Walter striking Louise?
Answer: No.

21. Do you recall Walter pushing Louise?
Answer: Yes; if no, this ends questioning and code question 22 as a 0.

22. What had happened immediately prior to Walter pushing Louise?
Answer: Physically she had pushed him down; verbally she had ordered him out.

Debriefing Statement

"Now that the machine is off, we can tell you a little bit about the study. We're funded by the National Science Foundation out of Washington, D.C. We are investigating ways to quicken the judicial process in courtrooms. For example, some civil suits in Chicago have taken as long as seven years to come to completion. One possible way to quicken the judicial process is to video tape all of the witness' testimony, to splice the tape together in one trial and play it back to the jury on a T.V. monitor.

"Some attorneys, however, have criticized this method by saying that when we bring a T.V. camera into the room, it affects the witness' memory about the original events and that's what we're testing here. Half of our subjects come and answer these questions in front of a T.V. camera while the other half answer the same questions only with no camera. Then what we do is to compare the testimony of the two groups, one with and one without the camera, and then we check the difference between what these groups remember about the original argument."

APPENDIX E

DEMOGRAPHIC QUESTIONNAIRE

THE NATIONAL SCIENCE FOUNDATION

Department of Communication

Michigan State University

East Lansing, Michigan

Witness Study Participants:

We are now going to request that you fill out a questionnaire. You will notice that some of the questions ask for personal information. We would not ask these questions if they were not a crucial part of this research effort. Let us assure you that the information you give us will be kept absolutely confidential. In the process of data analysis, the information is disassociated from you as individuals. It would be impossible for anyone to gain any personal information about any of you from the final report that is prepared. The ONLY reason that we are asking you to put your name on the questionnaire is to match the information with other information for the purposes of analysis. All of the information you supply us, except your name, is translated into a language the computer can read. The questionnaires are then destroyed.

1. Print name plainly: _____
(Last name) (First name) (Middle name)

2. Address: _____
(Street address) (City or Village) (Telephone)

3. Where and When were you born? _____
(City, State) (Exact Date)

4. Sex: _____

5. Marital status (check one): Single( ); Married( ); Divorced( ); Separated( ); Widow or Widower( ).

6. Name of Spouse: _____

7. Occupation of Spouse: _____

8. Spouse Employed by: _____

9. Ages and number of children at home: _____

10. Have you any defects in your hearing? _____

11. Have you any defects in your vision? _____

12. Is your general health good? _____

13. Have you any physical infirmity? (Explain) _____

_____

14. State briefly the extent of your business or professional experience or other employment: _____

_____

15. What is your present occupation? _____

16. Employed by: _____

17. If not employed, state your present means of livelihood (for example, housewife; pension; etc.) _____

18. What duties do you perform in your present job? _____

_____

19. State what other occupation you have been in during the past ten years and what duties you performed: _____

20. Are you, or have you ever been, a law enforcement officer?

(Specify)_____

21. Have you ever studied law? (Explain):_____

22. How far did you go in school? (Indicate the highest grade completed or degrees received)_____

23. Have you ever been a party to any suit, either civil or criminal?

_____

24. If so, state the nature and number of each suit and in what court:_____

25. If you have any comments or thoughts about the experiment you just participated in, please write them here:_____

_____

_____

_____

26. Please indicate how nervous you were when testifying:

extremely nervous	quite nervous	somewhat nervous	neutral	somewhat calm	quite calm	extremely calm

27. If 0 is extremely calm and 100 is extremely nervous, how nervous were you?_____

THANK YOU VERY MUCH FOR YOUR RESPONSES.

Please hand this in to the coordinator.

APPENDIX F

CODING SHEETS

PART A INFORMATION QUALITY

WITNESS _____ 1 - 4 _ _ _ _

CODER _____ 5 - 6 _ _

QUESTION/ANSWER	SCALE (mark with an "x")	(NO.)	col.	code
3. Q:Spoke first? A:Walter	-2 -1 0 +1 +2	3.	7 - 8	_ _
4. Q:First statement A:Entertain bus. assoc. (walter)	-2 -1 0 +1 +2	4.	9 -10	_ _
5. Q:Louise disbelief A:Yes	-2 -1 0 +1 +2	5.	11-12	_ _
6. Q:What did Louise say? A:Peoria closes at 4:00	-2 -1 0 +1 +2	6.	13-14	_ _
7. Q:When was this said? A:Soon	-2 -1 0 +1 +2	7.	15-16	_ _
8. Q:Louise and finances A:Yes	-2 -1 0 +1 +2	8.	17-18	_ _
9. Q:What did she say (finan) A:Rent and other bills due	-2 -1 0 +1 +2	9.	19-20	_ _
10. Q:Walt and Louise social A:Yes	-2 -1 0 +1 +2	10.	21-22	_ _
11. Q:Walter says? A:Louise out with friends	-2 -1 0 +1 +2	11.	23-24	_ _
12. Q:Baby mention? A:Yes	-2 -1 0 +1 +2	12.	25-26	_ _
13. Q:What said of baby? A:Louise said baby lacked	-2 -1 0 +1 +2	13.	27-28	_ _
14. Q:Louise strikes w/ paper A:Yes	-2 -1 0 +1 +2	14.	29-30	_ _
15. Q:What of strike A:Behind couch over money	-2 -1 0 +1 +2	15.	31-32	_ _
16. Q:Did Walter retaliate? A:No	-2 -1 0 +1 +2	16.	33-34	_ _
17. Q:He hit her back? A:No	-2 -1 0 +1 +2	17.	35-36	_ _
18. Q:This happen soon? A:Yes	-2 -1 0 +1 +2	18.	37-38	_ _
19. Q:Was there an interval? A:Yes	-2 -1 0 +1 +2	19.	39-40	_ _
20. Q:Walter striking? A:No	-2 -1 0 +1 +2	20.	41-42	_ _
21. Q:Walter pushing? A:Yes	-2 -1 0 +1 +2	21.	43-44	_ _
22. Q:What happened before? A:She pushed and ordered	-2 -1 0 +1 +2	22.	45-46	_ _

PART B ACCURACY OF MENTAL ABILITY

WITNESS_____
CODER_____

QUESTION/ANSWER	SCALE (mark with an "X")	(NO.) col.	1 - 4 5 - 6	code
3. Q: Spoke first? A: Walter	-2 -1 0 +1 +2	3.	7 - 8	- -
4. Q: First statement A: Entertain bus. assoc. (Walter)	-2 -1 0 +1 +2	4.	9 -10	- -
5. Q: Louise disbelief A: Yes	-2 -1 0 +1 +2	5.	11-12	- -
6. Q: What did Louise say? A: Peoria closes at 4:00	-2 -1 0 +1 +2	6.	13-14	- -
7. Q: When was this said? A: Soon	-2 -1 0 +1 +2	7.	15-16	- -
8. Q: Louise and finances A: Yes	-2 -1 0 +1 +2	8.	17-18	- -
9. Q: What did she say (finan.) A: Rent and other bills due A: Louise has ext. cost.	-2 -1 0 +1 +2	9.	19-20	- -
10. Q: Walt and Louise socia. A: Yes	-2 -1 0 +1 +2	10.	21-22	- -
11. Q: Walter say? A: Louise out with friends A: Stewart's household	-2 -1 0 +1 +2	11.	23-24	- -
12. Q: Baby mention? A: Yes	-2 -1 0 +1 +2	12.	25-26	- -
13. Q: What said of baby? A: Louise and baby lacked support	-2 -1 0 +1 +2	13.	27-28	- -
14. Q: Louise strike w/ paper A: Yes	-2 -1 0 +1 +2	14.	29-30	- -
15. Q: What of strike A: Behind couch over money	-2 -1 0 +1 +2	15.	31-32	- -
16. Q: Did Walter retaliate? A: No	-2 -1 0 +1 +2	16.	33-34	- -
17. Q: He hit her back? A: No	-2 -1 0 +1 +2	17.	35-36	- -
18. This happen soon? A: Yes	-2 -1 0 +1 +2	18.	37-38	- -
19. Q: Was there an interval? A: Yes	-2 -1 0 +1 +2	19.	39-40	- -
20. Q: Walter striking? A: No	-2 -1 0 +1 +2	20.	41-42	- -
21. Q: Walter pushing? A: Yes	-2 -1 0 +1 +2	21.	43-44	- -
22. Q: What happened before? A: She pushed and ordered	-2 -1 0 +1 +2	22.	45-46	- -

PART C - RESPONSE QUALITY

WITNESS_____ 1 - 4 _ _ _ S
CODER_____ 5 - 6 _ _

QUESTION	SCALE (mark with an "X")	(NO.)	col.	code
3. Q: Spoke first?	0 1 2 3 4 5	3.	7	-
4. Q: First statement	0 1 2 3 4 5	4.	8	-
5. Q: Louise disbelief	0 1 2 3 4 5	5.	9	-
6. Q: What did Louise say?	0 1 2 3 4 5	6.	10	-
7. Q: When was this said?	0 1 2 3 4 5	7.	11	-
8. Q: Louise and finances	0 1 2 3 4 5	8.	12	-
9. Q: What did she say (finan	0 1 2 3 4 5	9.	13	-
10. Q: Walt and Louise social	0 1 2 3 4 5	10.	14	-
11. Q: Walt say?	0 1 2 3 4 5	11.	15	-
12. Q: Baby mention	0 1 2 3 4 5	12.	16	-
13. Q: What said of baby?	0 1 2 3 4 5	13.	17	-
14. Q: Louise strikes w/ paper	0 1 2 3 4 5	14.	18	-
15. Q: What of strike	0 1 2 3 4 5	15.	19	-
16. Q: Did Walter retaliate?	0 1 2 3 4 5	16.	20	-
17. Q: He hit her back?	0 1 2 3 4 5	17.	21	-
18. Q: This happen soon	0 1 2 3 4 5	18.	22	-
19. Q: Was there an interval	0 1 2 3 4 5	19.	23	-
20. Q: Walter striking?	0 1 2 3 4 5	20.	24	-
21. Q: Walter pushing?	0 1 2 3 4 5	21.	25	-
22. Q: What happened before?	0 1 2 3 4 5	22.	26	-

MISCELLANEOUS

WITNESS_____ 1 - 4 ____
CODER_____ 5 - 6 __

QUESTION	time of response (sec.)	no. of words	nonverbal /vocal	neg. cog referen.	pos. cog referen.		
3.Q:Spoke first?						7 -12	
4.Q:First statement						13-18	
5.Q:Louise disbelief						19-24	
6.Q:Louise about disbelief						25-30	
7.Q:When said						31-36	
8.Q:Louise and finances						37-42	
9.Q:What she said of fin.						43-48	
10.Q:Walter of Louise (sec)						49-54	
11.Q:Walter says?						55-60	
12.Q:Baby mention						61-66	
13.Q:What said of baby?						67-72	
14.Q:Louise strike w. paper?						73-78	
15.Q:What of strike						1 - 6 7 -12	
16.Q:Did Walter retaliate?						13-18	
17.Q:He hit her back?						19-24	
18.Q:This happen soon?						25-30	
19.Q:Was there an interval?						31-36	
20.Q:Walter strike						37-42	
21.Q:Walter pushing						43-48	
22.Q:What happened before?						49-54	
TOTAL SCORE							

Total time_____ (sec.) 55-59 ____

Total words_____ 60-65 _____

Total nonver/voc_____ 66-68 ___

Total neg cog ref_____ 69-71 ___

Total pos cog ref_____ 72-74 ___