

# *Psychological Factors Affecting Eyewitness Testimony: A Modern Literature Review*

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**Abstract.** Eyewitness testimony has historically been considered strong evidence in criminal investigation and legal decision-making. However, research in psychology and neuroscience demonstrates that memory is flexible, reconstructive, and subject to errors. This review presents the literature from the last twenty years to consider how psychological factors; especially stress, narrowing of attention, and susceptibility to post-event information, interact with legal processes to conform to the accuracy of eyewitness evidence. Taking into consideration the experimental, field research, and meta-analyses, it begins with contextual analysis of how stress and attentional narrowing affect availability and retrieval in high pressure situations, but then reviews research on misinformation effects, memory conformity and cognitive mechanisms such as source monitoring errors that contribute to memory errors. It also assess the role of procedural variables in the Justice system where procedures may facilitate or inhibit accuracy (interview techniques, lineup structure, administrator bias, recording confidence). Altogether, the literature demonstrates eyewitness memory is influenced by internal psychological states as well as external procedural contexts. The last sections discuss practical repercussions for interviewing, identification procedures, and courtroom evaluation. The aim of this review is to provide stronger understanding on how to increase the reliability of eyewitness evidence by bridging findings from cognitive, forensic, and applied psychology.

**Keywords:** Eyewitness memory, misinformation effect, suggestibility, confidence–accuracy relationship, memory reliability

## **1. Introduction**

Eyewitness testimony has long been considered one of the most powerful forms of evidence in the criminal justice system worldwide. However, it has only been in recent decades, and especially through the very active research agenda from psychological and related disciplines, that it has become apparent that human memory is not a perfect recording of events but rather a reconstructed and highly malleable process [1]. This realization has generated increasing concern over the reliability of eyewitness testimony in the courtroom, particularly in light of the number of wrongful convictions, often because of mistaken eyewitness identification, which have subsequently been overturned through DNA evidence [1].

Interest in the eyewitness psychology dates back to the late 19th century. When early pioneers (such as Alfred Binet and Hugo Münsterberg) began to ask whether a witness's recollections could ever be fully accurate. The eyewitness literature has since developed into a deep interdisciplinary field, often touching on integrative areas of psychology, neuroscience and forensic science. Current literature suggests that various psychological factors influence how eyewitnesses perceive, encode, and recall events [2].

Current circumstances of surveillance and social media create challenges such as conflicting visual sources and rapid information spread, which can both augment and complicate eyewitness reliability. Understanding these cognitive processes is important. The intent of this literature review is to report and integrate contemporary empirical studies on identified psychological variables influencing eyewitness accuracy. To achieve this, the review systematically considers recently published empirical studies to answer the research question:

To what extent do psychological factors—such as stress, attention, suggestibility—and legal procedures impact the dependability of eyewitness evidence?

The structure of the review begins with theoretical context followed by a review of study findings in three primary areas: stress and arousal, attention and inattention blindness, and memory suggestibility, and concludes with the consideration of implications and recommendations of legal application.

## 2. Conceptual and theoretical foundations

Eyewitness testimony is defined as verbal accounts of individuals who have witnessed a crime or a significant event. Across multiple studies, psychologists generally subdivide these sources of information into two primary categories: system variables, the elements controlled by the justice system itself (e.g., lineup compositions, interview procedures). And estimator variables, which are natural influences on an eyewitness's testimony that are not controllable (e.g., stress level, distance, lighting, emotional states) [3]. Differentiating between social variables and estimator variables was suggested by Wells and extended in later research. Scholars and practitioners have widely used this differentiation as the foundation of eyewitness theory.

Cognitive psychology provides a framework for understanding encoding, storage, and retrieval processes under varying conditions of reliability. The multistore model of memory postulates that sensory information must be cycled through attention and short-term memory before being consolidated into an individual's long-term memory. When any degree of stress or distraction occurs during the encoding phase, the ability to consolidate information into an individual's long-term memory is impaired, which can lead to distortions or lapses in memory [1].

A considerable theoretical contribution is the misinformation effect, which was evidenced in the research of Loftus & Palmer, which examined cases in which misleading post-event information altered the memory for an event. Subsequent research within memory systems has provided additional information about the cognitive processes underlying the misinformation effect, and memory distortions are usually caused by source-monitoring errors - when people confuse the source of information [4,5]. Retrieval itself can further exacerbate distortions through a process called retrieval-enhanced suggestibility whereby repeatedly recalling information leads people to develop additional false memories [6].

Now, with respect to the context of the legal system, traditionally, the courts simply operate with an assumption that confident witnesses tend to be correct. Research suggests, however, that there is an empirical basis to not validate that conclusion, as witness confidence is dependent on a number of factors, such as witness feedback and social pressure related to memory. Furthermore, their expert

survey indicated that among psychologists there is agreement that eyewitness confidence should only be deemed valid under controlled conditions where all system variables are fully minimized.

Finally, legal systems typically assume that confident witnesses are accurate witnesses. However, research has consistently found that confidence is a function of social feedback and context, not solely based on memory accuracy [2,6]. Consequently, the reliability of eyewitness testimony is impacted by both truthfulness and cognitive vulnerability.

### 3. The impacts of stress on encoding and retrieval

Stress and arousal are well-established estimator variables that have received much empirical attention in respect to their impact on eyewitness performance. Stress increases arousal and attention toward threat-related/stimuli but too much arousal decreases accuracy because it reduces encoding of peripheral information and detail. This relationship is reflected in the Yerkes–Dodson law where relationship between arousal and performance is visually represented as an inverted U-shape. Moderate stress can improve recall but too much or too little arousal will result in decreased accuracy [3].

Deffenbacher et al. performed a meta-analysis of more than 25 empirical studies and found that the high-stress condition significantly produced lower correct identifications and increased false alarms in comparison to low-stress identification conditions [3]. Other more recent studies have confirmed this effect of high stress during encoding of memory, such as in mock-crime studies stimulating a realistic crime; all studies indicated impairments in memory for details, such as correctly identifying facial features and recognition of an object [2].

Neurobiological explanations contribute greater clarity to these findings. During stress, the release of cortisol and catecholamines influences the hippocampal region for encoding and prefrontal functioning for retrieval processes [1]. Wulff and Thomas hypothesized that the effects of stress on the witness might produce an attentional tunneling that draws attention to focus on survival-related stimuli but may narrow the breadth of encoding. It helps explain why witnesses in stress may have an accurate memory of the weapon in the incident but not be able to accurately identify the face of the perpetrator.

However, scholars cautioned against overgeneralizing the notion of “stress impairs memory,” Marr argued that lab conditions that do not replicate real-world witnessing conditions [2]. Witnessing an incident involves a set of complex affective cues and contexts that are usually not replicated by a stress manipulation created in the laboratory. This concern has been referred to as the pristine conditions hypothesis, assuming that laboratory encoding conditions without distractions of the real-world or without emotional self-engagement, which offers inflated estimates of accuracy. Marr's commentary was a call for the field data, whether it be by way of police simulation studies, or actual witness reports to advance the discussions of stress and memory.

In general, there is evidence indicating that an acute and high intensity of stress can interfere with peripheral detail encoding and retrieval accuracy, and moderate levels of stress produce inconsequential or slightly enhancing effects on central detail retention. Methods, timing of stress induction, and tasks complicate generalizations. Nevertheless, it is still clear that stress does not merely disrupt processes, but rather acts as a modulator of attention and memory resources, influencing how information is encoded and reconstructed during types of testimony.

#### 4. Attention, inattention blindness, and encoding limitations

The absence of attention results in a lack of memory encoding; information never enters the encoding process. Attention failures in eyewitness contexts are common because of divided attention, distractions, or brief event sequences, among other things. An example of this is the concept of inattention blindness, where an observer fails to notice or perceive an unexpected object that was visible while their attention was focused on something else [1].

Wulff and Thomas argued that attentional selectivity under stress creates a type of “perceptual bottleneck” that limits encoding to a very narrow field, which in turn can directly affect retrieval later on. This means that even witnesses who are highly confident can be confidently wrong if their attention was never directed towards the critical peripheral details.

Experimental paradigms, which include the "gorilla video" task and mock crime experiences, have established that the cognitive demand on an observer's attention can lead them to overlook central information. This work supports the attentional control theory, which suggests that anxiety associated with stress serves to impair executive control over attention, subsequently biasing attention and encoding towards threat cues. Exposure to stress will thus impact the quality of memory and even what is encoded in the first place.

Glomb and colleagues suggest new strategies for connecting laboratory and field studies, and provide data on attention allocation in eyewitness contexts. Their findings provide evidence that participants in realistic, motivationally engaging experiences will have a greater attentional narrowing and higher rates of omission errors compared to a traditional laboratory task [7]. Their work shows that attentional allocation is impacted by the contextual manipulation of realism and the motivation of emotional engagement.

The implications for the legal profession are considerable. When a witness does not recall certain details, it may not be a result of (honest) deception, but rather that the witness was limited and genuine in their attentional capacity at the time of the incident. Additionally, police questioning and other forms of interrogation that assume witnesses had full attentional capacity and coverage of the scene, can result in misattribution errors or coerced false memories when witnesses try to 'fill in the blanks' retrospectively. Therefore, understanding attentional processes can enhance the interpretive fairness of legal evaluations and improve the training of investigators and jurors.

In summary, research on attention and inattention blindness builds upon the stress literature by providing a cognitive account of some limitations faced by eyewitnesses. From the stress literature, it is known that stress narrows the width of attentional focus, and what gets encoded for the sake of memory is a function of attentional limitations. Both of which influence the reliability of what the eyewitness remembers in court [1,7].

#### 5. Suggestibility and the misinformation effect

One of the most robust phenomena documented in the cognitive psychology literature is known as the misinformation effect. It is the effect that occurs when the memory of an original event is changed by exposure to misleading information that occurred after the event [4]. In a foundational study demonstrating this effect, Loftus and Palmer showed that changing the verbs in a sentence related to a video of a car accident (e.g., “smashed” vs. “hit”) could change how participants remembered the accident. Subsequent studies have enhanced the understanding of this phenomenon by exploring its cognitive mechanisms and the social contexts that facilitate misinformation. For instance, Ayers and Reder , in a recent review of behavioral mechanisms underlying the misinformation, concluded that memory updating happens as a result of source misattribution—

specifically, suspected misattribution of misleading information to the event rather than an external source.

More recently, Zhu et al. demonstrated evidence of some cognitive abilities on the part of individuals, such as working memory capacity and reasoning, that contribute to reducing the risk of being misled. This indicates that not all witnesses are equally vulnerable to misleading information [8]. Higher working memory capacity and analytical reasoning appear to buffer against suggestibility. Nevertheless, the social aspect of suggestible memory remains potent, as the need for conformity in discussing events with witnesses can lead to a collective false memory, or memory contagion. These findings suggest the importance of following procedural measures to prevent discussion of the event among witnesses and to ask non-leading questions.

Witness warnings can also address misinformation. Karanian et al. have shown neurobiologically that warnings prior to the event mediate encoding processes associated with suggestibility [9]. Torrance et al. have shown that warnings can improve confidence calibration and accuracy in eyewitness testimony [10].

Overall, demonstrate that suggestibility operates on both cognitive mechanisms and social context. These studies raise the need for non-leading questions and disallowing co-witness conversations.

## 6. The link between confidence and accuracy

A witness' confidence often serves as a cue for assessing credibility in court, but research shows that confidence and accuracy are only weakly linked. In a meta-analysis published in 2024, the average across-subject correlation for confidence and accuracy was around  $r = .22$ , suggesting that a confident witness may not be correct [11]. Numerous factors contribute to this weak relationship. One factor is post-identification feedback. If there was a police confirmation about the subject of the identification, the level of confidence can inflate, even when the identification is wrong. These findings emphasize the need for procedural safeguards—such as isolating witnesses and using neutral questioning—to ensure the integrity of testimony in legal proceedings.

On the other hand, some research suggests that initial confidence can predict accuracy at a modest level in controlled settings (e.g., if subjects are presented with a issue fair line-ups, or immediate recall of the event;). Therefore, what context or procedure contributes to enhanced link should be further encouraged. The larger issue for courts has little to do with this discernment; however, it concerns how the expression of confidence was made and if it is aware of what process occurred prior to the confidence expression.

## 7. Legal procedures, system variables

Psychological factors, or estimator variables, are beyond the control of the legal system and stand in contrast to system variables, which can be regulated through procedural design. Extensive research has examined procedural factors—such as line-up structure, questioning techniques, and administrator bias—that influence eyewitness reliability. For instance, there is strong research-based evidence to suggest that sequential line-ups of suspects (i.e., viewing suspects individually) lead to less relative judgment errors than simultaneous line-ups [12]. In addition, double-blind procedures, where the investigating officer does not know the identity of the suspect, can help prevent unintentional cueing that may result in biased responses by the witness.

There is also juror knowledge or understanding that factors into the issue. For example, Douglass and Lyon found that jurors tend to overestimate the accuracy of testimony from a highly confident

witness and underestimate the distorting impact of stress or suggestibility [13]. Upon making conclusions about witness testimony with this bias, jurors may engage with the legal processes in ways that provide undue weight or support for unreliable witness testimony, or evidence to dismiss memory reliability concerns. In response, psychological research has proposed policy interventions, including cautionary jury instructions and expert testimony, to clarify the reliability of eyewitness memory.

## 8. Conclusion

Eyewitness testimony can be strong and supportive evidence, but also can be perilous in the pursuit of justice. Psychological research shows that stress, attention, and suggestibility significantly undermine the reliability of eyewitness evidence, and procedural safeguards can be enacted to reduce or intensify their limitations. The value of eyewitness memory does not depend on the inaccuracies of human beings, but rather, on people's value for recognizing and adjusting for evidence inaccuracies. In short, by implementing empirical evidence into courtroom practice, the justice system can strive to reconcile the persuasive force of evidence with the scientific reality of eyewitness memory.

In conclusion, psychology suggests that eyewitness testimony is subject to cognitive inaccuracies when memories are manufactured, as well as situational inaccuracies when pressures are encoded and retrieved. Stress and attention can lead to disrupted encoding and misremembering will sometimes occur when influenced by either post-event misinformation or social influence. In short, jurors are advised to not depend on confidence judgements as a measure of estimating memory accuracy. Jurors will often misinterpret the association between these two. Nevertheless, evidence-based procedural improvements, guided by psychology evidence, are available that produce significant improvements in reliability and quality of eyewitness evidence (e.g., double-blind, immediate confidence, provision of an expert witness).

Future research should further integrate cognitive neuroscience tools—such as fMRI (functional magnetic resonance imaging), EEG (electroencephalogram), and eye-tracking—to uncover the neural mechanisms of memory distortion and their implications for forensic assessment. Additionally, cross-cultural research might investigate whether cultural norms around authority or conformity impact suggestibility in different societies. On a policy level, collaboration between psychologists and the law remains important to ensure that courtroom practices reflect modern scientific knowledge of memory.

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