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Cognitive Distortions and Schema Biases in Eyewitness Memory

Cognitive psychology research has shown that human memory is not like a photographic camera, but rather is a construct, and eyewitness memory is a key factor in the criminal justice system. The process of remembering is susceptible to distortions, both because of its own intrinsic cognitive limitations and because of the outside environment. Bartlett's (1932) Schema Theory, which suggests that people use pre-existing cognitive structures (schemas) to process, store, and recall information, is at the heart of the understanding of these distortions. Schemas fill in gaps of memory with expectations, general knowledge, or post-event information rather than with veridical traces. This essay will critically assess the effect of these cognitive processes on the accuracy of testimony by addressing three specific cognitive processes at different temporal phases of an event: attentional capacity and the weapon focus effect during encoding, post-event misinformation and leading questions during storage, and relative judgment biases during line-up retrieval. Finally, this essay will show how cognitive research evidence can be integrated into actual judicial processes, and examine the practical and ethical barriers to using cognitive theory in actual eyewitness settings.

The encoding stage is the first processing of information in the memory system, and it's especially vulnerable to cognitive limitations when under stress, like when witnessing a crime. One central cognitive phenomenon affecting how well one encodes information is the Weapon Focus Effect (WFE), which describes how the presence of a weapon causes an eyewitness to attend to only that threat and neglect to encode peripheral information, such as the characteristics of the perpetrator's face.

The main theoretical hypothesis that has been proposed to explain this is the Cue Utilisation Hypothesis by Easterbrook (1959). Easterbrook suggested that emotional arousal and physiological stress would be a significant factor in decreasing an individual's central cognitive processing. With rising arousal, attention becomes more focused and narrow, attending only to the central, high-salience cues (e.g., a weapon) at the explicit cost of the periphery. In Bartlett's (1932) schema theory, if attentional capacity is limited during encoding, the memory trace will have major structural gaps. Thus, the witness is only able to remember the event later through schematic reconstructive processes, where the peripheral information is missing, and this significantly raises the chances of distortion.

The weapon focus effect has been well documented in the literature. In a typical foundational laboratory study, Loftus et al. (1987) showed a series of slides depicting a customer paying a cashier in a restaurant. In one condition, the customer pulled out a gun, while in the control condition, the customer handed over a chequebook. The researchers used eye-tracking technology to find that participants took much longer to look at the weapon than the chequebook, and that they made more fixations on the weapon. Most importantly, this shift in attention was directly linked to a reduction in the number of correct answers to the specific questions about the scene and recognition of the perpetrator from a lineup. Even in modern lab settings, including virtual reality experiments, weapons consistently divert attention from critical facial information, and as shown in this study, this would certainly have an impact on the encoding of detail.

There are, however, some important theoretical and methodological weaknesses in the WFE. A significant controversy in cognitive literature is whether this is solely an emotional arousal and threat phenomenon, as Easterbrook suggested, or whether it is because of visual unusualness/out-of-context novelty. Unexpected objects in benign contexts, such as a customer with a raw chicken in a bank, have been shown to elicit the same types of attentional narrowing and memory loss as a weapon in a crime context by researchers like Pickel (1998). This indicates that schema expectation (how surprising an object is in a particular context) may contribute more to visual capture than physiological fear.

Furthermore, the ecological validity of laboratory studies investigating WFE has been questioned. Laboratory participants observe violence without the fear, threat or personal involvement that real victims of violence may have. In an interesting field study by Yuille and Cutshall (1986), they conducted interviews with 13 real-life witnesses of a fatal shooting outside a gun shop in Canada. The memory of eyewitnesses was highly accurate in both the presence and absence of a gun, even four to five months after the event, and high stress levels were associated with higher memory precision, not with memory impairment. This is an important aspect of laboratory-based cognitive research because the factors (motivation, arousal, and attention) may interact in very different ways in real-world, high-stakes contexts and in experimental settings.

In the storage or retention interval, which is the time between seeing an event and formally being asked about it, memory is much more malleable and easily altered. Misleading questioning, media reporting, and discussion with co-witnesses of post-event information (PEI) can enter into and permanently change the original memory trace. This vulnerability is primarily

explained by Loftus's Misinformation Effect Hypothesis and Johnson et al.'s (1993) Source Monitoring Framework.

The Misinformation Effect is the phenomenon where eyewitness memories of an event are affected by inaccurate information presented after the event. Cognitively speaking, this stems from constructivist perspectives of Bartlett (1932). If a witness does not complete a memory trace, post-event suggestions fill in external information that is integrated into the person's internal memory scheme. With time, it becomes difficult to keep the difference between what is seen and what is proposed. This error is described more extensively by the Source Monitoring Framework (Johnson et al., 1993), which focuses on the metacognitive decision-making process of identifying the source of a recalled detail, when an internally generated memory or additional information suggested by events is confused with a genuine, visually encoded memory of the crime scene.

There are many examples of post-event memory distortion; Loftus and Palmer (1974) carried out a well-known experiment exploring how language can alter memory. They showed participants short films of car accidents and then asked them to estimate the speed of the vehicles. Crucially, the wording of the question varied; some were asked how fast the cars had "smashed" into each other, while others heard gentler verbs like "hit" or "contacted". It was found that participants given the strong verb 'smashed' gave higher speed estimation than those given 'hit' or 'contacted'. When those who got the word 'smashed' were asked the same question a week later, without viewing the clip again, they were much more likely to falsely report seeing broken glass at the scene, even though there was none in the video. It was shown here that the

way that a post-event is phrased not only changes verbal response strategies, but impacts the underlying cognitive representation of the memory itself.

In the same way, distortion of the event tends to happen with social interaction among co-witnesses. Gabbert et al. (2003) studied "memory conformity" by having pairs of people watch a video of a crime, with each person viewing a slightly different angle, so that one member of the pair would see things that the other could not.. In a discussion of the event, an alarming 71% of participants incorrectly recalled details of which they had not personally witnessed but had heard from their co-witness. This illustrates that post-event schemas quickly taint memory storage because of schematic blending.

Even though there is solid empirical evidence, there is still a need for critical theoretical and methodological research on post-event misinformation. One key criticism has been whether the original memory can actually be overwritten by misleading post-event information or whether a competing memory trace is simply accessible. There are some studies, using warning cues (e.g., informing participants that post-event information may be false before testing, to allow for the successful retrieval of the original veridical memory), which indicate that the original trace may not be completely obliterated but rather suppressed or overshadowed (Blank & Launay, 2014).

Furthermore, laboratory research on post-event misinformation has also been criticised for having demand characteristics. In an experimental context, participants could change their responses because they believe the researcher is giving them "hints" or the post-event questions

are correct. In real-world forensic situations, with real consequences that can be faced for false testimony, witnesses may be more prone to being cautious and a bit less responsive to small linguistic tricks than undergraduate student lab samples.

The retrieval stage is when an eyewitness tries to retrieve and report information that has been stored in his memory, particularly important in formal police identification. Retrieval is a reconstructive cognitive process that is sensitive to external cues and structural biases, and is not a passive readout of memory. One of the most important ways that witnesses' accuracy may be influenced in this phase is their choice of strategy when asked to choose an individual for the line-up, which can be either a relative judgment or an absolute judgment.

Witnesses are likely to use a relative judgment strategy (Wells, 1984) when they are shown a traditional simultaneous line-up, in which all the fillers (innocent people with similar descriptions) are displayed at the same time. Relative judgment involves comparing the individual's appearance with each of the other members of the lineup to see which one resembles the crime perpetrator more than the others. This approach is useful for determining correct identifications when the actual perpetrator is also in the lineup, but it is problematic when the actual perpetrator is not present in the lineup. Police stations often get numerous incorrect identifications as witnesses are drawn to the person whom they think they remember best, because they expect the police to have caught the person they are looking for. In the latter experimental condition, however, the line-up members are presented one at a time, requiring witnesses to compare each member to their internal memory trace of the perpetrator before proceeding to the next member of the line-up (Lindsay & Wells, 1985).

Empirical evidence strongly suggests that sequential presentation formats have a positive effect on reducing false identifications. According to Steblay et al. (2001), they conducted a landmark meta-analysis which combined the results of 23 studies that examined the comparative effectiveness of simultaneous and sequential line-ups. Their analysis found that the number of false identifications for perpetrator-absent line-ups decreased significantly when presented in a sequential format (15%) compared with presenting them in a simultaneous format (27%). This showed that simultaneous formats lead to a selection response bias, while sequential formats lead to careful response bias due to criteria matching with the actual memory trace.

Theoretically, however, cognitive processes involved with retrieval line-up performance continue to be debated. The traditional view of the superiority of sequential line-ups is challenged by proponents of Signal Detection Theory (SDT) and receiver operating characteristic (ROC) analysis (e.g., Wixted & Mickes, 2014). Wixted and Mickes suggest that sequential presentation does not decrease memory discriminability because it simply makes the witness more conservative, that is, less likely to select anyone at all. In SDT modelling, simultaneous line-ups can actually maintain more diagnostic accuracy when witnesses can compare diagnostic features across choices, as long as non-biased procedures are followed (e.g., the double blind and filler selection).

Moreover, post-identification feedback has a large influence on retrieval accuracy. Wells and Bradfield (1998) showed that giving a witness a “Good, you identified the suspect” after he made a choice significantly increased his retrospective confidence in his memory for the crime,

and his ease of seeing the actual crime. This is particularly relevant in terms of how a witness's confidence-accuracy calibration can be compromised following the retrieval stage, and during trial cross-examinations where the jury's perception depends largely on the witness's level of certainty.

Overall, research on eyewitness memory framed within a cognitive-psychological perspective has shown that memory is constructed, malleable, and systematically distorted at all memory stages. According to Bartlett's Schema Theory from 1932, humans do not just store events without interpretation, but rather fill in information in their brain based on existing cognitive structures. However, at encoding, high stress and weapons reduce the amount of information that witnesses can attend to, so that only schematic information is given to them for non-central information (Easterbrook, 1959; Loftus et al., 1987). When stored, post-event misinformation and leading language become part of the memory trace, leading to source monitoring failures (Johnson et al., 1993; Loftus & Palmer, 1974). Lastly, during retrieval, structural lineup biases promote relative judgment strategies, which lead to higher rates of false identification in perpetrator-absent lineups (Stebay et al., 2001).

The implications of these cognitive understandings have important implications for law enforcement and legal systems. In order to reduce contamination of the memory, cognitive psychologists have developed the Cognitive Interview (Fisher & Geiselman, 1992) that employs the following techniques: context reinstatement, open-ended questioning, and different temporal recall. In addition, double blind sequential lineup procedures expressly address the relative

judgment tendencies, which decreases misidentification in criminal identification procedures (Lindsay & Wells, 1985).

There are important ethical issues, however, in examining how cognitive research is applied in real-world criminal justice contexts. One of the major causes of wrongful convictions is eyewitness misidentification, which poses serious human rights and social justice issues. There is an ethical dilemma in legal systems between maximising correct perpetrator identification and minimising false accusations. Some procedures which decrease false positives can also lead to small decreases in correct identification, which may require police and prosecutors to consider the risk of releasing a guilty suspect and the moral consequences of convicting an innocent one. In conclusion, the comprehension of the cognitive aspects of eyewitnesses is vital for the creation of the lawful procedures which will guarantee the integrity of the evidence while at the same time ensuring that the law is being observed in the best interests of the parties concerned.

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