

## 3.2 Eyewitness Testimony

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Eyewitnesses play a significant role in criminal investigations and legal processes worldwide. According to UK police officers, witnesses to crimes usually provide the central leads for an investigation (Kebbell & Milne, 1998). Similar results are found in Dutch research on police investigations (De Poot et al., 2004). After all, witnesses can report about what happened and who was involved and thereby also provide valuable context for the evaluation and interpretation of forensic evidence like fingerprints, DNA and ballistic profiles. Research on Dutch criminal cases showed that technical forensic evidence only plays a subsidiary role compared to the information witnesses can bring to a criminal investigation (De Poot et al., 2004). Information from witnesses is often crucial, as an unknown suspect can be identified with DNA in only a few per cent of cases (Mapes et al., 2014, 2015). From these findings it is no surprise that testimonies of eyewitnesses are of great importance in court (Dubelaar, 2014). This not only applies to inquisitorial systems, like the Dutch legal system, but also to adversarial systems, like the UK and US systems. The inquisitorial system can be described as an inquiry to determine the truth, whereas the adversarial system involves a competitive process between prosecution and defence to determine facts (see, for a comparison of the systems, Spencer, 2016; Van Koppen & Penrod, 2003). But despite the variation in criminal justice systems, eyewitness testimony plays a crucial role in legal decision-making worldwide.

Human memory, however, is fallible and susceptible to distortion and misinformation (Loftus, 2005). The fallibility of memory is frequently shown in laboratory studies but most dramatically by the Innocence Project in the United States (Innocence Project, 2017). So far, in the United States 365 convicted persons have been exonerated with DNA evidence (Innocence Project, 2019). The largest contributor to these wrongful convictions is problematic eyewitness evidence (Garrett, 2008). As a result of these cases, eyewitness evidence now has a bad reputation. These cases, however, should not be used to support the idea that we should not trust eyewitness testimony. The fact that incorrect eyewitness testimony plays a role in the majority of wrongful convictions is only to be expected in light of the fact that eyewitness testimony plays a role in the vast majority of all criminal cases. Besides, eyewitness evidence is not the only evidence that plays a prominent role in wrongful

convictions. Forensic evidence also has its share, as seen in nearly half (45 per cent) of DNA exoneration cases and one-quarter (24 per cent) of all exonerations in the United States (American National Academy of Sciences, 2009; Innocence Project, 2019; Kassin et al., 2013). Just like any other type of forensic evidence, eyewitness evidence has a margin of error.

Research has shown that eyewitness memory can be of high quality when it is preserved correctly by a well-trained interviewer using proper investigative interviewing procedures (Fisher et al., 2011; Wixted et al., 2018). Similar to DNA evidence and other kinds of forensic evidence, the quality of eyewitness memory is protected if it is not contaminated and if appropriate testing procedures are used. Even for many of the wrongful convictions that were later reversed by DNA evidence, eyewitnesses had provided useful evidence on an initial, uncontaminated memory test (Wixted et al., 2018).

Insight into the cognitive processes of a witness is vital for understanding why people make mistakes. Therefore, the chapter will start with a brief description on the organisation of memory, in which we explain why witness memory is not 100 per cent accurate and how memory mistakes may occur. This is followed by a description of variables that affect witness testimony, in which we follow the three stages of memory (Loftus, 1996): witnessing, retention and retrieval. Next, we discuss various factors affecting judges' and jurors' assessments of witness testimony, which in turn influence legal decision-making. Finally, we summarise our findings and make some concluding remarks.

Before we start, it is important to clarify the terminology used in this chapter. We use the term *validity* to refer to the extent to which the witness's story corresponds to what has really taken place. In the literature and in legal contexts, this is often referred to as *reliability*, but in psychological terms, reliability actually refers to the extent to which the witness's story told within one or multiple statements is consistent (see also Netherlands Register of Court Experts, 2020).

### The Organisation of Memory

Remembering *what* happened, *who* did something and *when* it occurred is characteristic of *episodic memory*. When testifying as a witness, it is this type of memory that is addressed. Episodic memories are a unique personal mix of visual, auditory, social, emotional and contextual elements. All these elements are stored in different parts of the brain but are linked to each other to make it possible to remember a coherent episodic memory (Gazzaniga et al., 2018). The connections between the pieces of information are made in the hippocampus. When an episodic memory is retrieved, the different types of sensory information located in different parts of the brain are retrieved and brought together. In this way the episode is reconstructed

into a coherent memory. Remembering an event is therefore a reconstructive, rather than a reproductive, activity (Nader et al., 2000; Schacter & Loftus, 2013). It is important to realise that memory, due to this process, does not work like a video with a 'play button', which shows the footage of an episode in precise detail and correct sequence, every time this button is pressed. Instead, our brain is a piece of survival equipment that helps us to anticipate and prepare adequately for future events (Schacter, 2012). This requires constant updating of relevant memories with new information, which may also result in forgetting or changing original information. While remembering or testifying as a witness, the reconstructed memory can contain fragments of what was originally witnessed mixed with elements that were not witnessed but are meaningfully associated with the original observations. To decide which parts of the recollection are true (originally witnessed) or false (added information from another source), is extremely difficult. This characteristic of human memory makes it vulnerable to errors caused by suggestion (Loftus, 2005).

Over the past 25 years, the focus of eyewitness memory research has shifted from the failures of memory to the question of what works and what does not work when interviewing witnesses. Knowledge about memory processes is used to develop best practices for the gathering of high-quality witness evidence, resulting in the research field called 'investigative interviewing', which provides evidence-based methodologies to elicit valid information from witnesses (see the chapter by Milne and Kebbell, this volume, for a detailed description). Extensive research has shown that when scientifically supported interview methods, such as the cognitive interview, are used correctly by a well-trained interviewer, considerably more valuable information can be obtained from witnesses (the chapter by Milne and Kebbell, this volume, elaborates these points).

### Validity of Eyewitness Evidence

Many factors affect the validity of testimony provided by witnesses. Some factors emerge early at the witnessing phase, while others occur afterwards. Wells (1978) introduced the now-famous distinction between estimator variables and system variables.

System variables are factors that are or can be *under the control* of the criminal justice system. These variables involve, for instance, the delay between witnessing and being interviewed, the procedure to identify a perpetrator in a line-up, and the interview methods used to obtain witness evidence. Because system variables are under the control of the criminal justice system, they should be optimised to obtain high-quality evidence. After all, high-quality procedures are likely to produce high-quality testimony and low-quality procedures are likely to produce, at best, limited

information and, at worst, inaccurate information or entirely false accounts (Gabbert et al., 2018). Research shows that the continued use of sub-optimal interviewing techniques reflects a training issue, which is a perfect example of a system variable that can be improved when necessary (Dando et al., 2008; Hewitt, 2001).

Estimator variables, in contrast, are *not under the control* of the criminal justice system. These include, for example, the viewing conditions of the witness, the level of stress experienced during the witnessed incident and witness characteristics such as age, vulnerability or intoxication. These variables can affect the nature and quality of the evidence a witness is able to provide. Many estimator variables have been studied extensively in laboratory situations and as a result, there is a great deal of knowledge on how these variables may affect the validity of eyewitness memory in controlled conditions. Because we have no control over these variables for witnessed incidents in real-life situations, their impact on witness testimony must be considered in a post-hoc manner by the investigators (Gabbert et al., 2018). This requires skilled investigators with sufficient knowledge of human memory. However, research shows that experts working in judicial contexts typically do not know much about memory (Granag et al., 2005; Odinet et al., 2015; Wise et al., 2011).

We started this chapter by showing the importance of witness evidence for legal decision-making. Optimising system variables and gathering adequate knowledge about estimator variables are both key factors to well-informed decision-making in legal contexts. Specifically, for the quality of witness evidence, it is vital that police training programmes are continually informed by the latest research on investigative methods, that legal decision makers keep abreast of relevant research findings, and that researchers work to inform, innovate, and educate in the applied context (Gabbert & Hope, 2018). We will now discuss some specific variables that are likely to affect memory about an event, starting with variables operating at the witnessing stage, then the retention stage, and finally the retrieval stage (Loftus et al., 1996). The first variables are clearly estimator variables, while further down the list, variables become more and more under the control of the justice system. A complete review of all the factors that can affect witness testimony is beyond the scope of this chapter, so we focus on what we consider the most relevant variables.

### Witnessing: Observing an Incident

'Imagine, you are standing in a store when someone in dark clothes runs in. The person is holding a gun and screams at you to put your hands up. Adrenaline rushes through your body, everything goes so quickly and before you realise, the incident is over. Later, you have to testify at the police station

about what you have just experienced'. This is a typical script of how eyewitness testimony comes about. Let us see how different variables may affect your testimony about this event.

### Attention

The first prerequisite for remembering a particular detail of a witnessed event is that the witness paid attention to it in the first place. Without attention, no memory will be formed. Attention is selective for information that is important at that moment. A classic example of the principle of selective attention is the 'gorilla' study (Simons & Chabris, 1999). In this study, participants were instructed to count the number of passes between basketball players in a short video clip. At one point in the video, a person dressed in a gorilla suit walks right across the playing field, pounds his chest and walks out of the frame. Even though the gorilla appeared right at the point of fixation and looked rather unusual, about half of people viewing the video did not notice him. Their attention while 'witnessing' was diverted to another task, namely counting the passes. A similar situation could occur in real life, if witnesses' attention is diverted away from the crime taking place.

### Arousal

In threatening situations such as witnessing a violent crime, people typically experience high levels of arousal as a result of high cortisol levels. Cortisol is the hormone responsible for the fight-flight response, which helps us to survive dangerous situations. A meta-analysis by Deffenbacher and colleagues (2004) showed that high levels of arousal decreased correct identifications and reduced memory for event details. Furthermore, the fight-flight response has a narrowing effect on attention. Under threat, our attention is focused on information relevant for survival, rather than peripheral information. For example, in a field study by Odinet et al. (2009), witnesses who had been standing close to the robber during the incident subsequently reported more survival-related details than witnesses who had been further away (see also Woolnough & MacLeod, 2001). One form of the attentional narrowing effect in stressful situations is the *weapon focus effect*: people can give a detailed description of the weapon but not of the person holding the weapon (Loftus et al., 1987). A meta-analysis showed that the presence of a weapon during a witnessed event substantially reduces the amount of information reported about the event and also has a small but significant negative effect on eyewitness identifications (Fawcett et al., 2013).

### Viewing Conditions

Another important variable that has a direct effect on the amount of information a witness can provide involves the viewing conditions. For example,



the amount of light and the distance from the event directly affects the number of details a witness provides and the likelihood that the witness correctly identifies the perpetrator (Lindsay et al., 2008; Wagenaar & van der Schrier, 1996). Similarly, longer exposure duration gives more time to perceive details and increases the accuracy of recall and identification (MacLin et al., 2001). During an interview, investigators can use a detailed and complete map of the crime scene to help determine the viewing conditions at the time of the witnessed event. The specific weather conditions, time of day, potential obstructions to viewing and whether the witness was wearing the right glasses at the time all constitute crucial information.

### Intoxication

A large percentage of eyewitnesses are under the influence of alcohol and/or drugs while witnessing the crime (e.g. Evans et al., 2009). Alcohol intoxication impairs the encoding and consolidation of memories and therefore, affects the information they are able to provide. Field studies on the effects of alcohol on memory showed that, when again sober, individuals who had been moderately to severely intoxicated during encoding were less complete in their memory reports, remembering fewer correct details than sober individuals (Van Oorsouw & Merckelbach, 2012; Van Oorsouw et al., 2015). So, if an eyewitness was under the influence of alcohol while witnessing a crime, they may report less information to the police a few days later compared to an eyewitness who was sober during the crime. However, sometimes eyewitnesses are interviewed immediately, while they are still intoxicated. In this case, intoxicated individuals also have a tendency to report fewer correct details (Van Oorsouw et al., 2015). Furthermore, there seems to be a negative relationship between level of alcohol intoxication and memory performance: the more intoxicated you are, the worse your memory for that event is. Similarly to alcohol, cannabis has been shown to affect eyewitness memory by decreasing the amount of correctly reported details (Vredeveltdt et al., 2018). However, cannabis-intoxicated witnesses did not make more mistakes than sober witnesses. Moreover, cannabis intoxication did not influence eyewitnesses' ability to identify the perpetrator in a line-up. Unfortunately, research in this area is limited and a lot is still unclear about the exact effects of different drugs on eyewitness memory.

### Retention: Remembering and Forgetting

'Again, imagine the robbery in the store. The robber has gone, and everything occurred so quickly that you cannot believe what just happened. Other people in the store experience this too and everyone is aroused and eager to talk about what they just experienced. After a few minutes the police

officers arrive, and they ask you a few questions and your phone number. They tell you that you will be contacted for a full interview at a later date at the police station'. In the time between witnessing an event and being interviewed by the police, many factors can alter and shape the original memory for the event, due to distortion, contamination by post-event information or simply through the process of forgetting.

### Co-witness Influences

When eyewitnesses talk to each other before talking to the police, they often adopt details from each other's testimony. For example, the majority of witnesses end up reporting information about an event that they did not witness themselves but obtained through discussion with another witness (Gabbert et al., 2003; Paterson & Kemp, 2006; Wright et al., 2009). Information from co-witnesses is easily added to the original memory, even when this information is false or was never witnessed. Due to the organisation of memory, we are not always able to discriminate between 'old' and 'new' information by remembering the original source, which is known as the *source monitoring* problem (Johnson, 2006; Johnson et al., 1993; Johnson & Raye, 1981). This phenomenon makes sense from a memory process perspective, as we constantly update our memories with new information and most of the time the source of new information is not relevant. In an eyewitness context, in contrast, it is crucial that witnesses report only what they have observed themselves. It is therefore important to separate the witnesses as soon as possible after the event, to prevent them from influencing each other's memory. Thus, eyewitnesses can contaminate each other's memory by adopting each other's errors. However, under certain conditions, they can also help improve each other's testimony. Vredeveltdt and colleagues (2016, 2017, 2018, 2019) found that conducting a collaborative interview with two witnesses, after they have provided initial individual accounts, typically leads to more accurate testimony. Specifically, they found that witnesses were about twice as likely to correct each other rather than adopt each other's errors. Moreover, by providing retrieval cues to each other, witnesses remembered more new information after the discussion. Thus, when used appropriately, co-witness discussion can have a beneficial effect on eyewitness testimony.

### Forgetting

Forgetting is a well-known characteristic of human memory. It is a necessary process for a properly functioning memory. For example, we only want to remember where we parked our car today and not all the other places where it has been parked over the last two weeks. In a criminal investigation where every detail can be helpful, our tendency to forget information that is irrelevant to us, can be problematic. Research has shown that forgetting sets in

rather quickly. Following the classic Ebbinghaus curve (Ebbinghaus, 1885), most information is forgotten during the first hours after witnessing (Penrod et al., 1982). Longer retention intervals are associated with a significant decrease in the amount of information reported about a witnessed event, as well as a significant drop in accuracy (Odinot et al., 2012, 2013; Odinot & Wolters, 2006). This means that the gathering of information from witnesses cannot wait, as valuable evidence may get contaminated or lost forever due to forgetting. To address the need for the immediate gathering of information from witnesses, researchers have developed a tool that reduces potential risks of forgetting, exposure to post-event information and suggestive questioning: The Self-Administered Interview.

#### Self-Administered Interview

An in-depth high-quality interview should be planned in the first hours after the event to minimise forgetting and contamination of memories. However, in the hectic first hours after a crime or accident, it may be impossible to have enough skilled people available to conduct high-quality interviews. For these situations, researchers have designed the Self-Administered Interview (Gabbert et al., 2009, 2012; Hope et al., 2014). It is a 'pen and paper' tool in which witnesses are asked to give a written, detailed description of the perpetrator(s) and the witnessed event. It stimulates retrieval of the event by writing and drawing, with a number of key memory and cognition principles to support both the quality and quantity of retrieval, such as reinstating the encoding context, closing the eyes, and encouraging multiple and varied retrieval attempts. Research shows that participants who complete a SAI after a mock crime not only remember more information during the initial interview compared to the non-SAI group, but are also more resistant to misleading questions (Gabbert et al., 2012). The research suggests that an initial high-quality interview, even if it is on paper, can protect against the forgetting of valuable information and the undesirable effects of exposure to misinformation or suggestive questioning. The SAI is a neat example of how the negative consequences of estimator variables (delay and exposure to post-event information) can be prevented by a tool that can be considered a system variable.

#### Retrieval: The Collection of Witness Evidence

'After the robbery you are invited to the police station for a full interview. So, there you are, drinking awful coffee from a paper cup. You are a bit nervous, as the inside of a police station is new to you and you really hope your information is worth the effort'.

The research on eyewitness testimony has provided insight in the complexity of memory and difficulties of gathering eyewitness evidence. It has led to

the conclusion that the validity of eyewitness evidence is highly dependent on the way it is collected. Because investigative interviewing methods are discussed in the chapter by Milne and Kebbell, this volume, we will not go into best practices or interview methodologies. There is however, one essential system variable that we feel the need to mention: knowledge about memory.

#### Knowledge about Memory

The quality of eyewitness testimony depends heavily on the training and skills of the interviewer. Unfortunately, most police officers and legal professionals receive little training in interviewing and often lack adequate knowledge about how memory works (Benton et al., 2006; Granhag et al., 2005; Houston et al., 2013; Odinot et al., 2015; Wise & Safer, 2004; Wise et al., 2011). As a result, police officers conduct interviews based on their intuitions and on-the-job experience, resulting in mostly closed questions on different elements of the crime (Fisher et al., 2011). This can result in testimony that is incomplete, missing crucial details that could solve the case, or even inaccurate, if police officers (inadvertently) steer the witness towards a particular answer. Moreover, lawyers, prosecutors and judges may not spot the problems with the way in which information was elicited, since their knowledge about memory is similarly limited. Because information from eyewitnesses are the foundation of many decisions throughout the legal process, well-trained specialists in investigative interviewing are essential for an effective criminal investigation and well-founded decision-making in court.

#### Assessment: The Appraisal of Witness Evidence

Correct information can help investigators find suspects, but incorrect information can impede the investigative process, wasting valuable time and resources. Therefore, many researchers have searched for indicators that can distinguish accurate information from inaccurate information.

#### Confidence

Confidence in a memory is one of those indicators. There is an intuitive belief that confidence in a memory can be used to infer accuracy. Recent research has shown that the relationship between accuracy and confidence is more complex than initially thought. In earlier research, confidence was often reported as being only weakly correlated with accuracy. However, using correlations may not have been the optimal method of analysis for expressing the complex relationship between accuracy and confidence. Wixted et al. (2018) recently examined these older data in a different way. Their recalculation of some old datasets showed that the association between confidence

and accuracy is not as weak and unreliable as previously thought. A dataset involving a realistic stressful event showed that information rated with the highest confidence judgement was accurate 87 per cent of the time. This shows that accuracy and confidence are indeed related when it comes to episodic memory, which is consistent with earlier research (Odinot, 2008). However, the question is if confidence judgements can be used as an indicator for accuracy in episodic eyewitness memory. Although the recalculation of old data now shows a stronger link between accuracy and confidence, the forensic usefulness of this finding is still limited in real-life settings. Details remembered with high confidence are more often correct than details remembered with low confidence, but even the maximum level of confidence does not guarantee 100 per cent accuracy. And besides the challenge of incorporating confidence judgements during an interview without disturbing the interview flow, some witnesses will still report incorrect information with high confidence.

### Inconsistency

It is not unusual for witnesses to be interviewed more than once over subsequent sessions. The effects of *repeated interviews* are a source of controversy in legal contexts. The literature has highlighted advantages and disadvantages. Research has shown that people can retrieve new details at later recall attempts which they did not retrieve in an earlier attempt (i.e. reminiscence) and that there is an increase in the total amount of information during subsequent recall compared to the initial recall (Gilbert & Fisher, 2006; Odinot et al., 2013). One disadvantage of repeated recall is that it increases the chance that various kinds of *inconsistencies* occur. When a witness provides inconsistent information, concerns arise about the overall validity of the witness's account. Professionals in the legal system often believe that consistency is an indicator of accuracy (McNally, 2003; Odinot et al., 2015; Talarico & Rubin, 2003). Yet, experimental studies on the relationship between consistency and accuracy show that inconsistencies in a memory report are not strong predictors of inaccurate recall (Brewer et al., 1999; Fisher & Cutler, 1995; Gilbert & Fisher, 2006; Odinot et al., 2012; Smeets et al., 2004). Vredeveltdt et al. (2014) reviewed the literature on four different types of consistency: within-statement consistency, between-statement consistency, within-group consistency, and statement-evidence consistency. They found that only the latter type of consistency was related to deception; that is, contradictions between a witness's statement and the other available evidence are a sign that the witness is lying. The other three types of consistency, however, are completely unrelated to the trustworthiness of the witness. Inconsistencies or reminiscence items can be the result of different retrieval cues from one interview to the next as an initial interview does not per definition 'exhaust' witness memory. In fact, inconsistencies are a

logical product of how memory works. Newly remembered items are just as likely to be accurate as items remembered during an initial recall attempt (Gilbert & Fisher, 2006; Odinot et al., 2013).

### Response Latency and Retrieval Effort

Accurate memories are thought to be easier to recall than inaccurate memories. The ease with which someone retrieves a memory can be measured by response latency. *Response latency* refers to the amount of time witnesses take before initiating a response when they are asked about their memory. Research has shown that correct responses are given faster than incorrect responses (Ackerman & Koriat, 2011; Brewer et al., 2006; Gustafsson et al., 2019), indicating that witnesses respond faster when they are retrieving an accurate memory compared to an inaccurate memory. In addition, ease of retrieval can be measured by examining effort cues displayed by the witness. For example, when people describe accurate memories, they are less likely to pause while speaking, utter non-word fillers such as 'uhm', and use hedges such as 'I think' and 'maybe' (see e.g. Gustafsson et al., 2019; Lindholm et al., 2018). However, research on effort cues as indicators for witness accuracy is scarce and results vary across studies.

### Challenges for the Future

In criminal investigations and legal decision-making, there is still a world to win in applying theory to practice. One of the main challenges for researchers is to conduct research in more realistic settings and with a more diverse group of participants. The majority of eyewitness research to date has been conducted with video-recorded events and with participants from *Western, Educated, Industrialised, Rich, and Democratic* (WEIRD) backgrounds (Henrich et al., 2010), mostly undergraduate psychology students. One direction for future research is to examine what role cultural differences play in what and how witnesses report, how their testimonies are evaluated and how interviewers can improve their communication with witnesses with different cultural backgrounds (see also O'Brien & Kebbell, 2014; Powell & Bartholomew, 2003). It is heartening to see that this issue has recently started receiving more attention in the literature on eyewitness memory (see e.g. Anakwah et al., 2020, and a new research programme devoted to this topic, Amsterdam Laboratory for Legal Psychology, 2020).

One of the main challenges for practitioners is to base their interviewing practices and decision-making on solid scientific evidence. It is good to see that a growing number of law enforcement agencies have implemented evidence-based method from the field of investigative interviewing for gathering witness evidence (Griffiths & Rachlew, 2018). More and more police organisations



realise that obtaining eyewitness evidence requires well-trained specialists with adequate knowledge about human memory and good skills in investigative interviewing.

### Conclusion

The present chapter discusses some of the many factors that affect eyewitness testimony. At every stage of the memory process, witnesses can be influenced. Some of these influences cannot be controlled but need to be taken into account when evaluating the witness's testimony, such as whether a witness was stressed or intoxicated during the event. Other influences are under the control of the system, such as when and how a witness is interviewed. Taken together, the research shows that eyewitness memory should be treated like a physical crime scene: handled with care by professionals who have received specialised training. When witnesses are interviewed timely and professionally, eyewitness testimony is probably the most valuable source of evidence in the majority of criminal cases.

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