

CHAPTER 2

Memory Formation in Offenders: Perspectives from a Biopsychosocial Model of Eyewitness Memory

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INTRODUCTION

In spite of more than 100 years of eyewitness research, no comprehensive theory exists to explain either the between-subject memory variability found in eyewitnesses' accounts of criminal events or the within-subject mechanisms that lead to changes in eyewitnesses' accounts over time. In this chapter, we present a biopsychosocial model of eyewitness memory adapted for the offender context.¹ As scientist-practitioners, our goal was to develop an empirically anchored theory that can both explain research findings and

¹The model presented was developed to address memory formation with special attention to eyewitness memory and, therefore, is greater in its scope than presented here.

guide clinical practice. As such, our model reflects the current state of knowledge in the areas of affect, memory, trauma and crime, and emphasises both individual differences and group similarities. As practitioners, our interest was to make sense of the observed memory variability in the real world, not in unravelling the specific neuropsychophysiological mechanisms underlying this variability.² In other words, we took a top-down, rather than a bottom-up, approach that emphasised external validity. As theorists, we wanted to account for the variability in offenders' accounts of their crimes and, therefore, propose a comprehensive theory.

The proposed model is unique in two ways. Firstly, while we support the prevailing view that eyewitnesses' memories are strongly influenced by their emotional reactions, we argue that these emotional reactions are more complex and variable from one individual to another than previously proposed. Secondly, being well aware that emotional reactions, as well as memory formations, do not occur in a vacuum, we propose that there are a variety of predisposing, precipitating and perpetuating biopsychosocial factors that interact to guide an eyewitnesses' memory and provide a framework for their integration. After reviewing the eyewitness memory literature in terms of research approaches, identified memory patterns and prevailing theories, we introduce our view of emotional processing and delineate its implications for eyewitness memory formation. We then present our biopsychosocial model of eyewitness memory and its implications for research and practice.³

EYEWITNESS LITERATURE

Research Approaches

Eyewitness memory is the first hand account of a crime by a witness (perpetrator, victim or bystander). Eyewitness memory is one of the largest areas of study in forensic psychology, with most investigations being analogue in nature. Unfortunately, this over-reliance on laboratory research has limited the growth of the field.⁴ For

² Viewing these mechanisms as important, however, we hope others will explore them further.

³ For brevity, topics adequately reviewed elsewhere were summarised, with references provided. We acknowledge that a more thorough review of the literature would help clarify certain aspects of our model but our goal was simply to introduce our model. We plan to publish a book that more extensively explains our model and its implications.

⁴ The lack of statistical techniques that can capture the complexity of memory processes, while accounting for individual differences, is another limiting factor.

ethical reasons, such research precludes the examination of how actual violence/trauma – naturalistic situations denoted by significant stress/arousal – impacts memory; instead the focus is on the effects of low-intensity stress upon memory within sterile environments, resulting in findings of questionable generalisability (Tulving & Madigan, 1970). Indeed, although examining memory for such events is important, archival and field studies consistently reveal that memory for witnessed events is more varied, as seen in case law and clinical anecdotes, than suggested by laboratory research (Cutshall & Yuille, 1989; Kuehn, 1974; Tollestrup, Turtle & Yuille, 1994; Yuille & Cutshall, 1986); the former reveal memory patterns that the latter simply cannot yield (Yuille & Daylen, 1998), greater memory heterogeneity between eyewitnesses who view the same event (Cooper, Kennedy, Hervé & Yuille, 2002), and that memory is sensitive to a variety of post-encoding distortions (van der Kolk, McFarlane & Weisaeth, 1996). Rather than acknowledging these facts, some laboratory researchers have focused on criticising naturalistic research on methodological grounds, arguing for internal over external validity.⁵ This focus on internal validity has obvious theoretical implications: The results of an experiment that can control all extraneous effects – effects that typify real-life experiences – can more readily be explained by unidimensional models. Archival research and field studies, however, draw out the need for a multidimensional theoretical formulation.

Identified Memory Patterns

Given the contrasting findings between analogue, archival and field studies, it is only through their combination that the full range of eyewitness memory patterns emerges (Tulving, 1991). With this in mind, eyewitness research has revealed 10 memory patterns (Yuille & Daylen, 1998): normal forgetting, active forgetting, dissociative amnesia, state dependent memory, red out, remarkable memory, script memory, dissociative memory with either an external or internal focus, and created memory (Table 2.1).⁶ These patterns represent the end product of a mixture of processes (e.g., time-based forgetting, memory avoidance, affect-moderated encoding/retrieval, dissociation, etc.) that delineate memory quantity (i.e., amount of event-related

⁵ For example, a reviewer once commented: 'In the process of bringing the investigation to a real-life scenario, the researcher has lost the essence of the weapon focus effect' (anonymous reviewer, 2000).

⁶ Yuille and Daylen's (1998) categories were supplemented to reflect subsequent research.

Table 2.1 Identified memory patterns displayed by eyewitnesses

Normal Forgetting	Occurs for events of non-significance (i.e., routine/benign). Memory initially relatively good in terms of quantity and quality but benign nature causes superficial encoding prone to time-based forgetting and distortions. One of three patterns inducible in analogue research; may apply to some aspects of arousing events (e.g., peripheral details).
Active Forgetting	Occurs for events of significance. Memory initially good in terms of quantity and quality but, due to conscious avoidance of the memory and its triggers, loss of memory quantity (part/whole) occurs over time. Avoidance can lead to paradoxical effect: memory enhancement.
Dissociative Amnesia	Occurs for events of extreme significance (trauma) with loss of memory quantity (part/whole) developing during or following event; rule out organic causes. Poorly understood but not believed to reflect state-dependent effects and/or active forgetting, although latter may be a contributing factor.
State Dependent Memory	Occurs for events of significance and non-significance. Robust empirical support for latter: memory quantity reflects similarity between encoding and retrieval context (environment and internal state), with loss of detail reflecting extent of discrepancy. With regards to latter, memory thought to be dependent on similarity in affective state between encoding and retrieval.
Red Out	Occurs for events of significance; evidence limited to offenders. Results when affect is substantially altered (typically by rage), causing altered state of consciousness resulting in amnesia for violent act, with acts preceding/following being recalled. May reflect special case of dissociative amnesia but likely an extreme form of state-dependent memory.
Remarkable Memory	Occurs for events of significance (positive or negative) with memory (part/whole) generally being detailed, accurate, and retained over long intervals.
Script Memory	Occurs for repeated events of non-significance (e.g., day-to-day activities) or significance to which individual has habituated (e.g., repeated unchanging victimisation/offending). Memory reflects blending of episodes into one generalised memory ('script') that is retained over time.
Dissociative Memory	Occurs for events of significance leading to dissociative symptoms during or following event, with memory reflecting dissociative experience: External Focus: If the dissociative experience results in 'out of body experience,' event is perceived from an external perspective, resulting in memory of unique

quality characterised by observer perspective (e.g., looking in from detached, alternative viewpoint) as opposed to typical field perspective (i.e., through one's own eyes). Validity established but veracity of observer memories is unknown.

Internal Focus: If the dissociative experience results in partial/total loss of contact with reality, memory is significantly limited. If partial, focus will be on internal state, with memory evidencing little quantity but subjective qualities (i.e., event-specific affective/mental state; e.g., fear, mental confusion). If total, focus reflects dissociation into fantasy life, resulting in detailed but event-unrelated memory, with event-incongruent subjective qualities.

Created Memory False/illusory memory of event of non-significance or significance developed via suggestion or (theoretically) active fantasy life (fantasy becomes reality). Inducible in analogue research; field examples largely induced via suggestive/coercive therapeutic/investigative practices; also self-induced.

Labels meant to highlight dominant processes leading to pattern.

details; e.g., full recollection to amnesia) and quality (i.e., type [e.g., central vs peripheral], nature [e.g., field vs observer perspective] and accuracy [e.g., distorted to created details]).⁷ The first five deal with different patterns of memory loss, while remarkable and script memories reflect the long-term retention of memories. Dissociative memories reflect event-related processes affecting memory quantity and quality, and created memories are a product of suggestion, not of events, and therefore reflect quality. These categories are not mutually exclusive. For example, a perpetrator may show remarkable memory for the central details of a robbery but normal forgetting for its peripheral aspects. While the former might remain largely unaltered, the latter, given the reconstructive nature of memory, will fluctuate from one retelling to another (Erdelyi & Kleinbard, 1978), resulting in about 60% of the total details remaining equivalent over time (Conway, 1997).⁸ In addition, this list is not meant to be exhaustive but, rather, to represent the memory patterns stemming from known cognitive/affective processes. Clearly, other patterns could

⁷ As our intention was to explain eyewitness memory formation, accuracy refers solely to how well one's memory reflects the witnessed event, not to the instrumental distortion of memory.

⁸ An assumption of our model is that memory is not reproductive but reconstructive in nature (Schacter, 1996).

be added by considering additional influences (e.g., substance abuse leading to alcohol-induced blackout; Goodwin, 1995). Such moderating and mediating influences are, therefore, woven into the present theory.

Prevailing Theories

A fundamental assumption in the eyewitness literature is that memory is highly sensitive to emotion-mediated distortions (Christianson, 1992), with most investigators adopting a unidimensional view of emotion reflecting either valence (positive/negative) or arousal (high/low; Revelle & Loftus, 1990). However, emotional processing is much more complex: it includes both physiological (i.e., arousal) and cognitive responses (Mandler, 1984), the latter – when thinking in dimensional terms – reflecting both valence and arousal (Russell, 1989). Furthermore, scant attention has been given to the effects of physiological arousal on memory, independent of cognitive processes.⁹ This is remarkable given that trauma/crime create, by definition, strong arousal reactions (van der Kolk et al., 1996) and investigators generally interpret their findings in light of theories that propose memory is mediated by arousal (Christianson, 1992).

According to the Yerkes–Dodson 'law' (Yerkes & Dodson, 1908), the relationship between arousal and performance is curvilinear. Under this view, increases in arousal initially facilitate memory until it reaches an optimal level, at which point further increases in arousal have negative effects. Christianson (1992) points to numerous findings that suggest, as far as the central details of emotional events are concerned, high arousal can benefit all stages of memory, suggesting that the Yerkes–Dodson law has limited application for explaining eyewitness memory results. Accordingly, Christianson and others turned to Easterbrook's (1959) cue-utilisation hypothesis, which proposes that arousal reduces attentional mechanisms (i.e., restricts the range of cues attended to), that is, one's ability to engage in parallel processing (Easterbrook, 1959). Initially, this restriction benefits performance by allocating all available resources to the task at hand so that central (relevant) information is attended to at the detriment of peripheral (irrelevant) information, as seen in numerous analogue studies. Theoretically, as stress mounts to real-world levels,

⁹ Laboratory studies have thus far largely focused on the cognitive representation of arousal.

the reduction in cue utilisation eventually includes central information, thereby increasingly limiting encoding, doing so in a manner suggested by the Yerkes–Dodson law. As such, we do not discount this process and, instead, view it as occurring in parallel with the cue-utilisation effect, as supported by contemporary views of basic memory consolidation (Humphreys & Revelle, 1984; Walker, 1958). At low levels of arousal, information transfer (IT) between short-term memory (STM) and long-term memory (LTM) is relatively poor, thereby hindering LTM formation. At moderate levels of arousal, IT improves, resulting in a larger amount of information being transferred from STM to LTM. With further increases in arousal, a larger amount of event-related information is sampled and placed within limited STM resources. At a certain point, STM becomes overloaded, as IT cannot keep up, resulting in certain memories never being transferred to LTM. Presumably, within the IT stream, central information – being more affectively loaded (see below) – is given priority over peripheral information.

While we endorse the view that high arousal influences parallel processing and memory transfer, we believe this disruption to be more complex as it leads to a variety of memory consequences. The inability of these theories to explain this variability, as well as post-encoding distortions, highlights the need for a more ecologically valid theoretical approach. Towards this aim, van der Kolk and colleagues (1996), based on their research on trauma victims, suggested extreme arousal in a personally threatening scenario causes a dissociation of the emotional/sensory aspects of memory from the narrative aspects. They do not propose that emotional stress affects the allocation of attentional resources, as proposed by Easterbrook (1959), but that it simply breaks the links between various cognitive processes, leaving each, however, intact in memory. Unfortunately, this theory has yet to be validated and is proving difficult to investigate. Furthermore, although we agree that some eyewitnesses may have access to a variety of memories (sensory to narrative), we question the premise that attentional and memory processes would fail to produce an encoding bias (e.g., narrative over sensory or vice versa).

EMOTIONAL PROCESSING

Most theorists agree that emotional experiences reflect two correlated, yet independent mechanisms: A biological system mediating arousal responses to emotional events and a cognitive system that evaluates

the significance of emotional events, each communicating with the other (Mandler, 1984). Within this framework, arousal refers to physiological activity produced by the autonomic nervous system (ANS), thereby setting the quantitative aspects of experienced emotions. ANS arousal (ANSA) also serves to prepare the organism for action, while concurrently signalling the mental system to remain alert and attentive – both of which are likely to impact memory. As ANSA is non-specific (i.e., does not produce a specific emotional response; Schachter, 1971), the cognitive system must perform a meaning analysis of the event in question to determine its emotional connotation (Mandler, 1984). Mediated by the central nervous system, it ascribes the particular quality of the emotion (e.g., pleasant vs unpleasant), which in turn serves to either decrease or increase ANSA (Mandler, 1984). Although these interpretative cognitions may be engendered by arousal, they are primarily defined by the general situation and current cognitive state of the organism, which themselves affect memory. Thus, it is the joint product of these systems that construct emotions as we know them: 'Arousal provides the intensity of the emotional state, and cognition provides its quality' (p. 119; Mandler, 1984). Since affect moderates memory formation, eyewitness memory research must consider each system and how they may differ across individuals and situations.

Individual Differences: Arousal Sensitivity and Affective Focus

Advancements in the study of affect (Blascovich, 1990, 1992; Mandler, 1984) suggest one's arousal sensitivity (i.e., biological sensitivity to ANSA) is a major factor mediating affective responses to events and, as such, memory for such events. Differing across individuals, it is viewed as a normally distributed dimension, with hypersensitives (low arousal threshold) and hyposensitives (high arousal threshold) defining the end points of the continuum (Blascovich, 1992; Figure 2.1). Since the labelling of environmentally elicited affect requires the perception of the ensuing ANSA, arousal sensitivity sets the threshold at which point an event becomes emotionally relevant (i.e., as it reaches/surpasses optimal levels). Table 2.2 provides a selective portrayal of how arousal affects hypersensitives and hyposensitives. As can be seen, the same situation can lead to a higher level of perceived arousal in hypersensitives than in hyposensitives.

Blascovich (1990, 1992) further postulated that arousal sensitivity delineates which aspect of the emotional response is paid most attention, doing so indirectly via its effect on cognitive development.

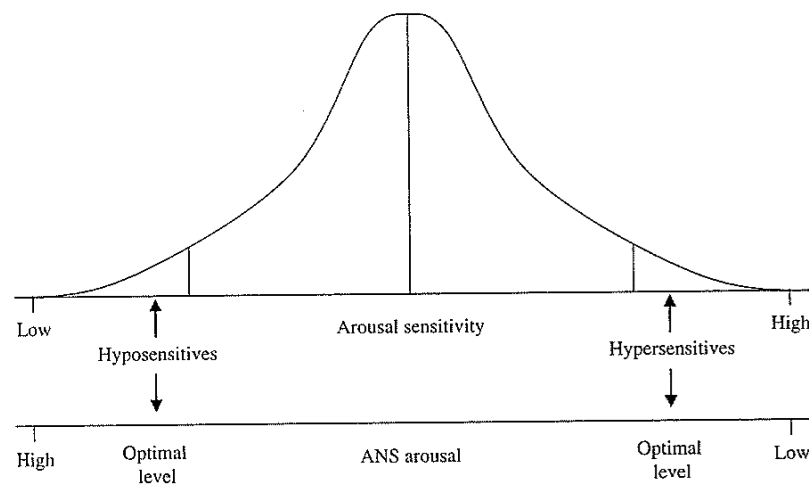


Figure 2.1 Theoretical distribution of ANS arousal sensitivity and consequent optimal arousal levels

Being sensitive to physiological changes, hypersensitives have learned to attend to internal (somesthetic) over external (environmental) cues when labelling their affect, while hyposensitives, being relatively indifferent to physiological changes, have learned to rely on external rather than internal cues. In line with this theory, Feldman (1995) found people to be either arousal-focused (i.e., an affective response strongly based on one's reaction to an emotional event) or pleasure-focused (i.e., an affective response strongly based on the interpretation of the emotional event) when evaluating their emotional reactions, as well as emotional events in general. Consequently, one would expect hypersensitives to have more physiologically based (emotional-sensory) memories and hyposensitives to have more cognitively based (autobiographical/narrative) memories for emotional events. Indeed, it is not uncommon to see eyewitnesses with a clear narrative-like memory without any accompanying affect or emotional memories without a clear narrative (van der Kolk & Fisler, 1995).

Given that this multidimensional emotional response and the manner in which it varies from one eyewitness to the next permeate all levels of our model, we now turn our attention to their influences on memory formation, following which our model and its implications for research and practice are presented.

Table 2.2 Hypothetical arousal perception and arousal-mediated effects on attention, memory, and suggestibility based on trait arousal sensitivity and intensity of event-related arousal

Event-related Arousal Effects	Hypersensitive	Hyposensitive
Extremely low		
Perceived arousal	Very low/Uncomfortable	Extremely low/Intolerable
Attentional bias	External>Internal	External<<<Internal
External ¹	Central>Peripheral	Peripheral
Internal ²	Cognitive>Sensory	Cognitive<<<Sensory
Memory distortions	RM/AF>NF/SM>DM(EF)/SDM (NF/SM) ⁴	DM(IF)/SDM>RM/AF (NF/SM) ⁴
Suggestibility ³	Mild/Internal	Extreme/External
Very low		
Perceived arousal	Low/Comfortable	Extremely low/Distressing
Attentional bias	External=Internal	External<<Internal
External ¹	Central=Peripheral	Central<<Peripheral
Internal ²	Cognitive=Sensory	Cognitive<<Sensory
Memory distortions	NF/SM	RM/AF/DM(IF)/SDM (NF/SM) ⁴
Suggestibility ³	None ⁵	Moderate/External
Low		
Perceived arousal	Medium/Optimal	Very low/Uncomfortable
Attentional bias	External≤Internal	External<Internal
External ¹	Central≤Peripheral	Central<Peripheral
Internal ²	Cognitive<Sensory	Cognitive<Sensory
Memory distortions	RM/NF/SM	RM/AF>NF/SM>DM(IF)/SDM (NF/SM) ⁴
Suggestibility ³	Mild/External	Mild/External
Medium		
Arousal perception	High/Uncomfortable	Low/Comfortable
Attentional bias	External<Internal	External=Internal
External ¹	Central<Peripheral	Central=Peripheral
Internal ²	Cognitive<<Sensory	Cognitive=Sensory
Memory distortions	RM/AF>NF/SM>DM(IF)/SDM (NF/SM) ⁴	NF/SM
Suggestibility ³	Moderate/External	None ⁵
High		
Perceived arousal	Very High/Traumatic	Medium/Optimal
Attentional bias	External<<<Internal	External≥Internal
External ¹	Central<<<Peripheral	Central≥Peripheral
Internal ²	Cognitive<<<Sensory	Cognitive>Sensory
Memory distortions	RM/AF/DM(IF)/SDM(RO) (NF/SM) ⁴	RM/NF/SM
Suggestibility ³	High/External	Mild/Internal

Very high		
Perceived arousal	Extremely high/Unbearable	High/Uncomfortable
Attentional bias	External<<<Internal	External>Internal
External ¹	Peripheral	Central>Peripheral
Internal ²	Cognitive<<<Sensory	Cognitive>>>Sensory
Memory distortions	DM(IF)/SDM(RO)>RM/AF(NF/SM) ⁴	RM/AF>NF/SM>DM(EF)/SDM (NF/SM) ⁴
Suggestibility ³	Extreme/External	Moderate/Internal
Extremely high		
Perceived arousal	Extremely high/Debilitating	Very high to Extremely high/Traumatic to debilitating
Attentional bias	Internal	External>>>Internal to internal
External ¹	N/A	Central>>>Peripheral to central
Internal ²	Sensory	Cognitive>>>Sensory to sensory
Memory distortions	DA	DM(EF)/SDM(RO)≥RM/AF (NF/SM) ⁴ to DA
Suggestibility ³	Extreme/External	High to extreme/Internal to External

NF = Normal Forgetting; AF = Active Forgetting; DA = Dissociative Amnesia; RM = Remarkable Memory; SDM = State-Dependent Memory; RO = Red Out; SM = Script Memory; DM = Dissociative Memory; ¹ = Central and peripheral information objectively defined; ² = Cognitive and sensory information of environmentally elicited affective response; ³ = Refers to both susceptibility level and type, the latter stemming from attentional bias (Created Memory not specified as reflects post encoding psychosocial factors); ⁴ = Occurs only if individual, due to personal history, habituated to event; ⁵ = While increasingly likely over time, suggestibility not provided as reflects state more than trait effects.

EMOTIONAL PROCESSING AND EYEWITNESS MEMORY FORMATION

Arousal Sensitivity

Physiologically, emotions reflect ANS reactions that lead to an orientation response characterised by a narrowing of attention onto the central aspects of the scene at the exclusion of peripheral details. This reaction intensifies as arousal rises, with memory distortions occurring at disturbing (traumatic) levels. Not everyone, however, experiences arousal in the same manner, with hypersensitives and hyposensitives being, respectively, susceptible and resistant to its effects. Being biologically pre-defined, early socialisation will, within limits, fine-tune one's trait arousal sensitivity (trait sensitivity), which will then remain relatively resistant to long-term changes. However, there are

a host of variables that can affect it at the state level (e.g., pre-trauma affect, threat level; see later), thereby functionally rendering individuals relatively hypersensitive or hyposensitive within a specific event (state sensitivity). Regarding memory, arousal sensitivity will dictate the point during arousal augmentation when one will experience the affect as traumatic and, consequently, display arousal-mediated attentional distortions, with more prototypical individuals showing greater effects. Given that hypersensitives are likely to interpret arousing events as traumatic at lower levels of arousal than hyposensitives, the former should display memory distortions earlier in the arousal stream and across a wider range of arousal levels than the latter (Table 2.2).

Cognitive System

Psychologically, emotions reflect cognitive interpretations. Throughout development, individuals learn to emotionally differentiate objects, situations and people (Mandler, 1984). New emotional events are then interpreted in light of both their current characteristics and one's emotional learning history. Clearly, interpretive sophistication will depend on one's cognitive capacities and, as such, neurocognitive functioning is thought to exert the most influence on this system. Given the developmental nature of this system, arousal sensitivity, temperament/personality, acculturation and certain more transient factors are also quite influential (see later). Together, these factors produce idiosyncratic cognitive filters through which events are interpreted, which should be evident in eyewitnesses' accounts. For example, while the statement of an intellectually limited offender should be relatively short, concrete and possibly echoing interpretative confusion (e.g., failure to fully understand the gravity of the situation, misinterpretation of social cues, etc.), that of an intellectually intact offender should evidence more complex and abstract language, more detail and relatively little interpretive confusion. Psychological profiles of interviewees could therefore help clarify their idiosyncratic responses.

The Interplay of Arousal Sensitivity and the Cognitive Interpretative System

A central aspect of emotional responses is that each component – ANSA and cognition – feeds back into the other, the end product having further memory effects. Arousal sensitivity, being innate to the organism, shapes the development of the cognitive system. Throughout development, hypersensitives and hyposensitives, respectively, avoid and seek out, arousing experiences (Ellis, 1987). As a result, arousal sensitivity

sets the parameters of one's emotional learning environments, information used to make sense of future emotional events. While hypersensitives will label events based on how they affect them emotionally, that is, along an arousal dimension (positive events as unexciting and negative events as arousing), hyposensitives will label events based on event-specific features, that is, along a valence continuum (low arousing as bad and high arousing as good) – labels that should be reflected in eyewitnesses' statements. For example, a hyposensitive (psychopathic) sex offender, when asked to describe how he felt when he raped for the first time replied:¹⁰ 'Pumped up, a real high. Yeah, I know it was wrong, but thinking about it still gives me a buzz'. When asked about the death of his mother after a long illness, his most salient comment was: 'The funeral was a real drag. I went to sleep'. Further examination clearly indicated this man evaluated events and experiences solely in terms of their ability to arouse or stimulate him. Indeed, he stated, 'If something gives me a rush, gets the adrenaline flowing, that's good. If it doesn't, that's bad. End of story' (personal communication, Hare, 1997).

By influencing the type of emotional information deemed subjectively relevant (central), arousal sensitivity also indirectly delineates what will be encoded into memory. On the one hand, hypersensitives have a very alert physiological system that, once engaged, sends a strong signal that is quickly experienced as disturbing. As a result, they – throughout development – have become especially attuned to, and focused upon, their internal states, all the while avoiding arousal-eliciting sources (Figure 2.2). Attention paid to the scene will be aimed at decreasing the intensity of the situation by, for example, locating an escape route (peripheral information). In other words, as arousal rises, they increasingly focus on peripheral information at the detriment of central information (Table 2.2; Figure 2.3). This reaction is akin to a phobic individual who, although peripherally aware of the phobic stimuli, continuously searches for a way to escape the situation (Thorpe & Salkovskis, 1998). On the other hand, hyposensitives have a relatively numb physiological system that not only takes greater stimulation to engage but, once engaged, sends a relatively weak signal that takes time to be experienced as disturbing. Being intrinsically under-stimulated, they have become especially attuned to, and focused upon, external stimulation, with sensory-emotive functioning being of secondary importance (Figure 2.2). Seeing no need to shy away from arousal-eliciting events, they use this (central) information to

¹⁰ Psychopathy, throughout this chapter, refers to the concept defined by the Hare Psychopathy Checklist-Revised (Hare, 2003).

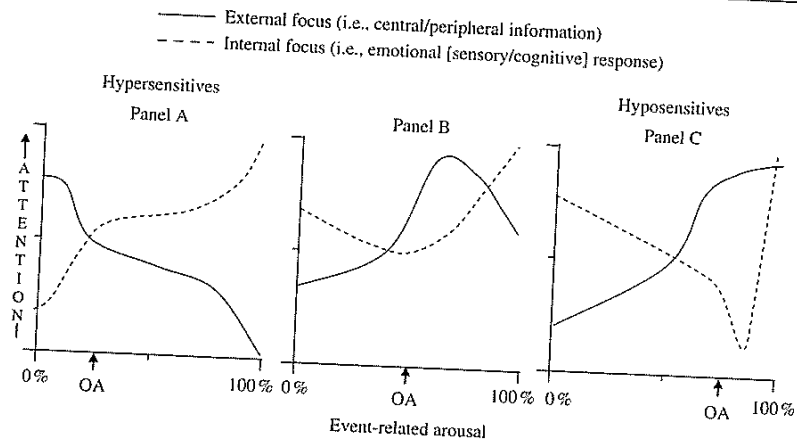


Figure 2.2 Theorised orintation response (external vs internal attentional focus) based on event-related arousal and arousal sensitivity (OA = optimal arousal)

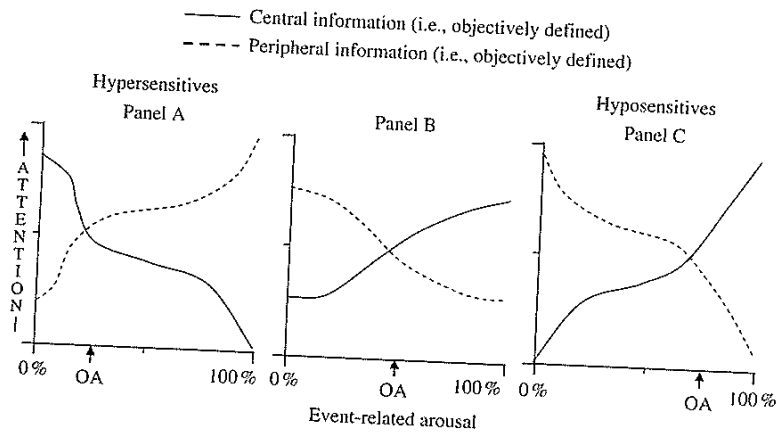


Figure 2.3 Theorised external orientation response (central vs peripheral attentional focus) based on event-related arousal and arousal sensitivity (OA = optimal arousal)

make sense of their affective experiences, with their internal states and benign (peripheral) aspects of the event receiving little attention – an effect that becomes increasingly pronounced as arousal increases (Table 2.2; Figure 2.3). This reaction is akin to that of experienced law

enforcement personnel who, although vaguely aware of their internal state and of surrounding activities during an armed standoff, focus their attention on the situation at hand. Any awareness of their own sensations and surroundings is likely to be of short duration and of secondary importance and, therefore, less likely to be encoded. Consequently, hyposensitives should generally make better eyewitnesses than hypersensitives (i.e., encode more central than peripheral information). For example, a psychopathic offender, when asked about his memory for perpetrated acts of violence reported: 'I remember everything I do and do everything I want'. Certain situations (e.g., imminent threat of death), however, will, by definition, trigger potent ANS reactions that will surpass even the hyposensitive's tolerance to arousal and, therefore, deserve attention (if only briefly; see Mandler, 1984). In essence, while peripheral to the investigative process, the sensory experience takes on a subjectively central role, suggesting that extremely arousing events will engender encoding of one's sensory experience, the extent of which reflecting one's arousal sensitivity (Figure 2.4).

Given the dynamic nature of events and emotions, interpretive cognitions are continuously being updated, with each update dampening or stimulating the arousal component of the affective response, which in turn influences attention and IT from STM to LTM.¹¹

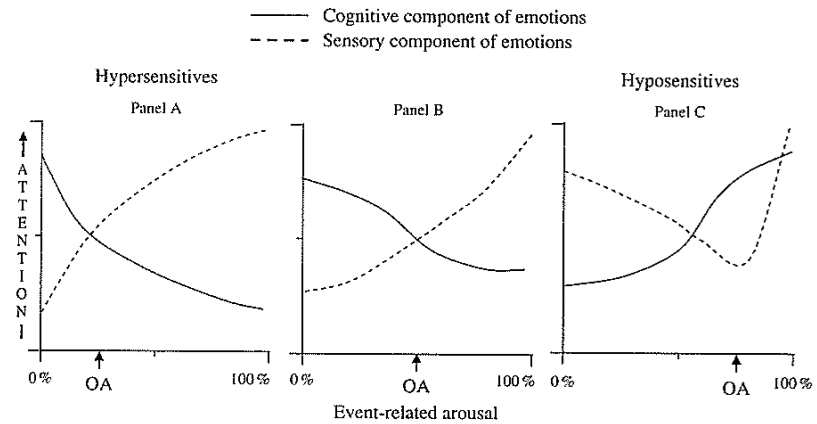


Figure 2.4 Theorised internal orientation response (cognitive vs sensory attentional focus) based on event-related arousal and arousal sensitivity (OA = optimal arousal)

¹¹ Under relaxed situation, the reverse pattern should be observed, a la Yerkes–Dodson.

Within arousing/criminal events, stimulating effects will quickly be interpreted by hypersensitives as significant, thereby leading them to further focus upon their internal (sensory) state and, to a lesser extent, subjectively relevant peripheral information. In addition, their already taxed STM resources will quickly become overloaded, thereby precluding LTM consolidation to benefit from efficient IT, especially for central information. The same situation, however, will take longer to be interpreted as significant by hypersensitives (if at all). When perceived as significant, it will cause them to increasingly focus upon central information and, to a lesser extent, their internal (cognitive) state at the detriment of peripheral information, with STM becoming increasingly taxed but not necessarily overloaded, thereby allowing LTM consolidation to benefit from IT efficiency. Conversely, dampening effects, reducing the stress on STM resources (especially for hypersensitives) and, therefore, allowing efficient IT to LTM, should result in hypersensitives encoding, in addition to their subjective experience, a wider range of peripheral information and possibly some subjectively relevant central information, and in hyposensitives encoding, in addition to central information, an increasing amount of subjectively relevant peripheral information, with their internal state becoming increasingly of secondary importance. That emotions are dynamic in nature highlights the fact that dampening and stimulating effects will have specific memory impacts depending when in the arousal sequence they become engaged, which explains why eyewitnesses may display a variety of memory patterns to the same event.

Finally, arousal sensitivity and mental ability will delineate one's predominant type of feedback during stressful/criminal events. In general, hypersensitives, who shy away from stimulation, and individuals of limited intellect, who are less able to make sense of their surroundings, are prone to catastrophise their experience and, therefore, engage ANS stimulation, while hyposensitives, who fear-not stimulation, and the intellectually intact, who can use their intellect to their advantage, may rationalise their situation, resulting in ANS dampening.

A BIOPSYCHOSOCIAL MODEL OF EYEWITNESS MEMORY

Overall, it appears that the quality and quantity of crime-related memories depends on the interaction between characteristics of the witness and event (Yuille & Daylen, 1998), a notion that permeates our theoretical approach. A central assumption of our model is that one's emotional response during a stressful/criminal event will delineate

both the quality and quantity of the ensuing memory. We stress the fact that emotional reactions are multidimensional in nature, reflecting both physiological and psychological processes that differ across individuals. Believing that emotional reactions, as well as memory formation, do not occur in a vacuum, we postulate that eyewitness memory variability stems from specific and interacting predisposing, precipitating and perpetuating biopsychosocial factors (i.e., factors that bias witnesses to respond to an event in a particular manner, affect witnesses during the event, and influence memory retention and reconstruction, respectively).¹² These factors generally exert their effect on memory indirectly by affecting primarily one's arousal sensitivity and/or secondarily one's interpretive system. Although receiving some empirical attention, these factors have yet to be incorporated into a comprehensive theory and, therefore, we propose a framework for their integration (see Figure 2.5).

Predisposing Factors

Predisposing factors are either innate traits or experiences that occur prior to the event in question and, as such, serve to delineate the typical response that someone will have to a stressful event. In other words, they serve to set the parameters of memory formation for the to-be-remembered event. This knowledge can then be used to predict the range in quantity and quality of memory that an eyewitness should display.

Biological variables

As highlighted previously, arousal sensitivity delineates the emotional impact of criminal events. This trait differs across individuals, from hypersensitives to hyposensitives, and development, with sensitivity theoretically increasing with age (Zuckerman, 1979). While males generally score lower on measures of arousal sensitivity and higher on measures of sensation seeking than females (Keogh, 2004; Zuckerman, 1979), it remains unknown whether these differences are innate and/or the result of early socialisation, and it may be the case that they, in part, reflect differences in the expression (rather than experience) of arousal sensitivity. Accordingly, investigators are urged to evaluate sensitivity on a case-by-case basis rather than by making group-based generalisations. Indeed, while primarily biologically predefined, there

¹² We distinguish between biological, psychological, and social factors as we view each of these realms as having important influences on memory in their own right.

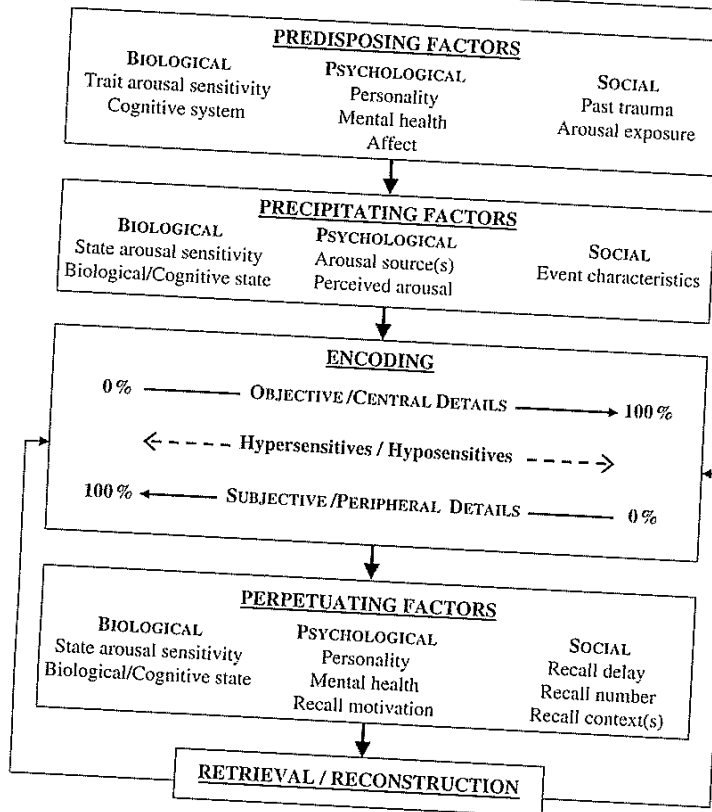


Figure 2.5 A biopsychosocial model of eyewitness memory

are a host of variables that may affect sensitivity development, as well as one's state sensitivity (see below). Irrespective if trait or state, hypersensitives will fall prey to arousal-mediated memory distortions earlier and over a wider range of arousal levels as compared to hyposensitives (see Figure 2.1).

Neurocognitive functioning is another innate trait with important implications for memory formation as it effects all stages of memory, namely: attention and working memory for delineating encoding quantity; spatial and language functioning for encoding quality; and memory functioning and processing speed storage, and executive and language abilities for the quantity and quality of retrieval, respectively. In light of feedback mechanisms, neurocognitive abilities also influence the quantity and type of information sampled from the environment.

Furthermore, the commission of crime, engendering ANS stimulation may disrupt mental processing, especially in the cognitively impaired. Considering an individual's neurocognitive strengths and weaknesses, which change throughout development and evidences minor gender differences at certain developmental stages, is therefore crucial to the understanding of his/her memory capabilities. This is especially significant in the offender context in which both innate (e.g., FAE) and acquired (traumatic brain injury; chronic substance abuse) neuropsychological impairments are found in disproportionate amounts, with acquired brain injuries – especially that affecting frontal lobe functioning (e.g., frontal lobe syndrome) – potentially leading to permanent changes in one's arousal sensitivity (i.e., from hyper to hypo or vice versa; e.g., Damasio, 1994). Of note, such brain damage should be accompanied with relatively abrupt changes in behaviour and memory characteristics (e.g., a previously instrumentally violent offender with good memory for his/her acts, becoming predominantly reactive in his/her violence and evidencing significant affect-mediated memory distortions).

Psychological variables

Arousal sensitivity has also been linked to personality, with introverts and borderlines being hypersensitives, and extroverts, sensation seekers and psychopaths being hyposensitives (Ellis, 1987; Eysenck, 1967; Zuckerman, 1979), suggesting that different personality types may succumb to arousal-mediated distortions at different points in the arousal stream. For example, the psychopath, who is theoretically the most arousal hyposensitive of all individuals (Blackburn, 1979; Hare, 1965), is likely to feel little traumatic arousal, at times even experiencing what others consider traumatic as pleasurable, and, therefore, will be relatively immune to arousal-mediated distortions (Christianson et al., 1996). By adding unique cognitive filters, personality also influences how events will be interpreted (Blair et al., 1995), with interpretations becoming increasingly idiosyncratic as personality becomes disordered in nature. Given that personality disordered individuals are prone to succumb to cognitive distortions in times of stress – such as engendered by crime – their eyewitness accounts should evidence personality specific distortions. For example, the narcissistic offender, believing in his/her invincibility, may recall an offence as much less threatening than a catastrophising borderline offender. Unfortunately, little is known regarding the role of personality on memory for crime (although see Oorsouw & Cima, Chapter 8, this volume).

Psychiatric status, with its links to arousal sensitivity and effects on cognition, is another important predisposing variable to consider. Some Axis I disorders may serve to delineate the intensity and quality of emotional responses, a point with memory implications. For example, individuals prone to anxiety are likely to be more sensitive to arousal fluctuations than individuals with no such history, thereby rendering them hypersensitive in stressful/criminal events irrespective of their trait sensitivity. Such disorders are also likely to have a significant impact on event-related interpretations. For example, a schizophrenic offender, given his/her fantasy world, is likely to have a more idiosyncratic – but not necessarily invalid – interpretation than would a non-schizophrenic. Like personality, little is known regarding the influence of Axis I disorders on eyewitness memory.

Finally, one's pre-crime affective state (be it chronic or acute in nature) will help define, in part, how arousing an event may be. As this factor has received no empirical attention, we speculate that, in regards to offenders, if one's pre-crime state coincides with the affect engendered by the commission of the offence, such as seen in acts of instrumental violence – as they serve to satisfy pre-defined goals – then their should be relatively little added ANSA and, therefore, minimal memory distortions. However, should the nature of the offence significantly alter one's affective state and do so in a negative manner, as seen in reactive types of offences, then significant ANSA should be experienced, resulting in memory distortions. By creating a uniquely intense affective experience, this latter process may be one pathway leading to state-dependent memories, as well as to the 'red out' phenomenon (Swihart, Yuille, & Porter, 1999). As this particular pathway is relatively independent of one's arousal sensitivity, hyposensitives should be as susceptible to this process as hypersensitives.

Social variables

Although one's trait sensitivity, being based in biology, is more resistant to change than one's cognitive system, both are nevertheless affected by past experiences (Mandler, 1984), thereby delineating one's state sensitivity to an interpretation of current events. While cultural and gender socialisation are likely to significantly influence the manner in which events are interpreted and, therefore, encoded, little is known regarding the influence of these factors on eyewitness memory.

Nevertheless, research suggests that one's personal history will affect one's future reactions. Highly arousing and unpleasant

experiences will sensitise people so that future traumatic events are physiologically and/or cognitively experienced as more disturbing than would have normally been the case (e.g., Porter, 1996; Terr, 1991; van der Kolk et al., 1996), thereby functionally rendering individuals hypersensitives, irrespective of their trait sensitivity. This view is consistent with the diagnostic formation of PTSD, a defining feature of which is hyperarousal/hypervigilance (American Psychiatric Association [APA], 1994). In contrast, high-intensity experiences that desensitise people to future arousing events render individuals hyposensitive, irrespective of their trait sensitivity. As such, desensitisation may explain the formation of script memories, as subsequent related events will be interpreted as more benign than would otherwise have been the case and, therefore, not require event-specific encoding. For example, while the novice offender might experience both fear and excitement during his/her first break and enter – resulting in an affectively loaded memory that deserves detailed encoding – the repeat offender, interpreting his/her action as a routine event – not unlike going to work – experiences little affect, thereby creating no need for detailed encoding; instead, the event will be integrated into his/her script for how his/her break and enters typically unfold. Given that initial events are more 'remarkable' than subsequent ones, one's script should be more heavily influenced by initial than subsequent events, especially with increases in delay between encoding and recall (i.e., more recent events may be initially intact but quickly evidence normal forgetting). This effect may occur even for repeated traumas but only if the individual experiences the new trauma as relatively benign (i.e., has become desensitised). It is important to highlight that script memories are not mutually exclusive from other ones and, consequently, investigators should be open to the possibility that scripts include various types, quantities and qualities of memories. For example, habituation may result in a false sense of safety that, when challenged (i.e., script violations; e.g., the unexpected arrival of the homeowners during a routine break and enter), leads to high arousal, resulting in the violation being ascribed emotional significance and, therefore, encoded. That is, departures will be encoded not as benign but as remarkable.

Precipitating Factors

Precipitating factors are specific to the circumstances of the event and, based on the parameters set by predisposing factors, further fine-tune memory formation (Figure 2.5).

Table 2.3 Hypothetical ANSA intensity changes across offence stages for eyewitnesses based on arousal sensitivity

	Hypersensitive			Hyposensitive		
	Offender	Victim	Witness	Offender	Victim	Witness
Pre-offence	High	Low	Low	Low	Low	Low
Offence	Very high	Extremely high	High	Medium	High	Medium
Post-offence	High	Very high	Medium	Low	Medium	Low

Biological variables

Engaging in criminal conduct results in ANS stimulation that, moderated by one's arousal sensitivity and cognitive capacities, affects both attention and memory. Hyper- and hyposensitive individuals not only experience arousal differently but, in light of affective feedback, also experience different arousal changes as the situation unfolds (excitatory vs inhibitory effects), suggesting that investigators consider the dynamic nature of offences, and the resulting changes in affective states, when taking eyewitnesses' accounts (see Table 2.3). Of special importance, are significant and unexpected changes (be it real or perceived) as such changes are likely to be potent ANSA moderators – especially for hypersensitives, with changes reducing threat perception decreasing ANSA and those increasing threat perception increasing ANSA.

As arousal reaches traumatic levels, it can have a debilitating memory impact by fully allocating attention either internally (for the hypersensitive; Table 2.2) or externally (for the hyposensitive; Table 2.2), both processes serving to dampen ANSA. That is, ANSA that surpasses an individual's traumatic threshold is likely to cause a dissociation (Spiegel & Cardeña, 1991) between the processing of internal and external cues, leaving only one source of information available for encoding. Obviously, each response would result in different memory consequences (Table 2.2). While the hypersensitive, focused inward, is likely to turn to his/her fantasy life and, therefore, experience a sense of derealisation (a feature of PTSD; APA, 1994), the hyposensitive, completely focused outward, is likely to take an observer perspective (Cooper, Cuttler, Dell & Yuille, [in press]) and, therefore, experience depersonalisation (another feature of PTSD; APA, 1994). Obviously, in terms of investigative value, the former process, leading to a dissociative memory with internal focus, is devastating and the latter, while engendering minor qualitative distortions, results in memories of investigative value (dissociative memory with

external focus). As noted previously, 'traumatic and unbearable' levels of arousal are likely to force all individuals internally (Table 2.2), with hypersensitives being prone to dissociate into fantasy and hyposensitives to focus exclusively upon their subjective experience, the only psychological responses left to reduce ANSA to manageable levels.

ANS stimulation also influences behaviour (e.g., fight vs flight) and, therefore, memory for the act (e.g., escape vs confrontation) in a manner consistent with one's arousal sensitivity. Hypersensitive offenders will want to get things over quickly, with unexpected/delaying events causing spikes in ANS reactions. They are likely to be highly focused on their internal states, especially when complications occurs, at which point escape will be of paramount importance. Hyposensitives, however, feel less rushed and less disturbed by complications, which they are likely to tune-out until unavoidable, at which point confrontation will be the likely course of action. The end result is that hypersensitives' memories will be characterised by more peripheral than central information, with hyposensitives showing the opposite pattern (Table 2.2).

Any factor that affects these biological responses should be considered when interviewing offenders about their crimes. One such factor is substance use, with depressants reducing ANS reactions and stimulants increasing them. Of course, substance use also affects one's cognitive capacities, with depressants slowing processing speed, stimulants increasing processing speed, and psychogenics adding unique cognitive filters. Additionally, they may result in state-dependent memories or block encoding altogether (e.g., alcohol-induced blackouts).

Psychological variables

While arousal sensitivity will delineate the type of trauma-related information allocated attention (i.e., internal vs external), it is the affective load attached to an event that will predominantly dictate how well and for how long a memory will be recalled (Table 2.2). Indeed, there exists good evidence that emotional events are better recalled than non-emotional events (Christianson, 1989, 1992; Thompson, Morton & Fraser, 1997). However, there also exists evidence that highly emotional events can result in significant memory loss (Yuille & Daylen, 1998). While the topic of much debate, this paradoxical effect is explainable when viewing emotional processing as multidimensional (Figure 2.6). The cognitive component of emotions, injecting personal significance to events, increases the saliency of memory traces by adding the number of cues available for memory reconstruction,

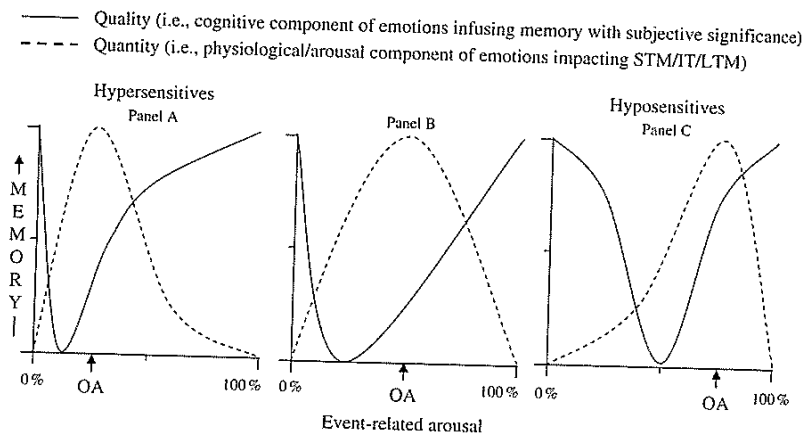


Figure 2.6 The theorised relationship between memory (quality and quantity) and emotions based on a multidimensional model of emotions (cognitive and physiological components), event-related arousal, and arousal sensitivity (OA = optimal arousal)

that is, details indirectly related to the event.¹³ This process is moderated by one's psychosocial history, including past experiences, personality, psychiatric status and crime-related motivation, which serves to add idiosyncratic interpretive filters. The physiological component of emotions also adds informative value to memories but, given the Yerkes-Dodson principle, only to a certain point. That is, it can increase the size of the memory trace by accelerating IT from STM to LTM, resulting in a greater number of cues available during memory reconstruction, that is, details directly related to the event. However, as arousal intensifies, limited STM resources become increasingly taxed, resulting in an increasing number of details not being transmitted to LTM. Therefore, objectively significant events that are subjectively interpreted as relatively benign (i.e., low-to-moderate intensity; e.g., benign, opportunistic crimes; day-to-day criminal activities), although initially remembered quite well, will be subjected to normal forgetting (Table 2.2). Conversely, events interpreted as significant but non-traumatic (i.e., moderate-to-high intensity; e.g., obsessively planned crimes; unique/novel criminal activities) will be remembered quite well and for long periods of time, thereby

¹³ Interestingly, this may explain the creation of remarkable memories at low arousal levels (Table 2.2).

leading to remarkable memories (Table 2.2). However, as interpretations become traumatic in nature, memory distortions (quantity and quality) will be increasingly evident (Table 2.2), with debilitating levels leading to dissociative amnesia – presumably by overwhelming memory consolidation altogether. As with other factors, this process is moderated by one's arousal sensitivity, with hypersensitives ascribing greater affective significance to arousing events than hyposensitives (Table 2.2).

Cuing an ANS response, criminal events also result in an orientation response that guides attention towards the source of the arousal (Burke, Heuer & Reisberg, 1992). Evidence indicates different memory effects occur depending on whether or not the arousal-source is part of the to-be-remembered event (Christianson, 1992). With respect to eyewitness memory, the source of the arousal is, in part, external; that is, caused by the crime being committed. Of course, offences may involve various arousal sources (e.g., victim, accomplice, factors that increase risk of apprehension), the attentional importance of which reflects one's meaning analysis and, therefore, being subjectively defined. If the sources are ascribed similar importance, then the resulting memory is likely to reflect their combination, thereby affecting quality. However, when one source is deemed more important than the others then it will receive encoding priority, thereby affecting quantity.

Event-unrelated arousal may also surface as a result of previous experiences (e.g., in the form of flashbacks). For example, the current crime may cue memories of past crimes (i.e., state-dependent memories), resulting in two arousal sources competing for limited attention. Memory distortions (e.g., combination of past and current events) can occur if the event-unrelated arousal dominates the processing stream (Christianson, 1992). In essence, they would form a type of script memory but one that is associated with a much greater affective load, and therefore containing more details, than habituation-initiated scripts, a difference that can be used to differentiate them during investigative efforts. If the combined affective load is uniquely experienced, then another form of state-dependent memory may emerge, with both emotional states needing to be present for retrieval to be successful. However, if the remembered event takes a significantly dominant role in the processing stream, then it may lead to total amnesia for the event proper, leaving the offender only able to report about peripheral information (e.g., events that preceded/followed the actual offence), as seen in the 'red out' phenomenon (Swihart et al., 1999).

The arousal source may also reflect motivational factors that initiated the crime. For example, a reactive murder committed in a fit of jealousy is likely to involve two arousal sources: The murderous

act and the jealous feelings motivating that act. Following Christianson's (1992) logic, event-unrelated arousal may take a dominant role for the murderer, resulting in an internal focus (e.g., feeling of betrayal/anger) and, therefore, memory deficits regarding the homicidal act. This process may provide another pathway to the 'red out' phenomenon. In such cases, the rage state, a defining feature of red outs, likely won over event-related information in the competition for attention. Thus, offenders who engage in reactive, emotionally driven crime/violence, where the motivation is internal and intense, should have relatively impaired memories of their crimes (Cooper & Yuille, Chapter 3 this volume). Ego-dystonic instrumental offences (e.g., being forced to rob to pay a debt; Hervé, Petitclerc & Hare, 1999), including multiple arousal sources, as well as potent ANSA, should also result in memory distortions. In contrast, offenders who engage in ego-syntonic instrumental offences (including violence), where the goal is more cognitively than emotionally driven, as well as external in nature, should have better memories for their crimes (Cooper & Yuille, Chapter 3 this volume).

Social variables

The encoding context, helping to define the subjective meaning of events, has its own effect on memory by delineating the intensity and quality of affective responses and, therefore, the affective load attached to memory. For example, Tollestrup et al. (1994) have shown that many fraud victims exhibit normal forgetting. As this victim is unaware that a crime has been committed until some time has elapsed, the event will initially be interpreted (encoded) as benign and, therefore, quickly forgotten (Yuille & Daylen, 1998). Similarly, certain types of events are likely to be interpreted as more significant than others and, therefore, to result in remarkable memories (e.g., one's first offence). Of note, if the event in question has never before been experienced, then, by definition, it will result in a unique emotional reaction, suggesting another pathway to state-dependent memories or, in its extreme, to the 'red out' phenomenon.

Another contextual variable is the feeling of personal safety during the event. For example, victims and injured victims report less crime-related information than witnesses and non-injured victims, respectively (e.g., Christianson & Hubinette, 1993; Kuehn, 1974). Clearly, highly arousing events where there is obvious danger evoke deeper and more personal sensations/cognitions, and therefore memory distortions, than those that, although highly arousing, do not suggest imminent danger. In terms of offenders, immediate and negative personal

consequences should therefore have serious effects on memory formation. For example, being arrested in the commission of the act (imminent loss of personal freedom) is likely to result in greater ANS arousal than being arrested during the course of the investigations, the former resulting in greater memory distortions (especially for the latter part of the act) than the latter. It should be noted, however, that the perception of danger is likely to be affected by other variables as well, such as arousal sensitivity, past sensitising and desensitising experiences and personality (e.g., by creating a sense of vulnerability or invincibility), suggesting that personal safety is, in part, subjectively defined. As noted previously, while culture and gender socialisation are likely to affect how events are interpreted (including threat perception), as well as one's event-specific behavioural reactions, these factors have yet to receive focused research attention.

Perpetuating Factors

Precipitating factors, which include many of the variables listed above, follow the to-be-remembered event and act to either increase or decrease the quantity and quality of memory. As memory is reconstructive in nature, it is susceptible to distortions each time it is retrieved, with initial accounts reflecting encoding-based distortions and, to a lesser extent, retrieval biases. As each retelling results in re-encoding (Figure 2.5), subsequent recollections are prone to increasingly evidence distortions reflecting the additive process of retrieval biases (Figure 2.5), especially for subjectively peripheral information. Unfortunately, such distortions may become memory reality (i.e., historical vs narrative truth; Hyman & Loftus, 1998; Nash, 1994), thereby permanently contaminating memory. Accordingly, the earlier one can get an account of the event under investigation the closer it will resemble historical truth, especially when dealing with a hyper-sensitive offender.

Biological variables

Arousal sensitivity is a significant perpetuating factor in light of its impact on memory decay (see above), recall motivation, and memory reconstruction. As hyper- and hyposensitives differ in their desire to broach (rehearse) arousing topics, the former will likely intrinsically avoid arousing memories, while the latter will savour them, thereby weakening and strengthening memory trace (quantity), respectively. In addition, when recall occurs, the attentional biases noted above will presumably influence the reconstructive process of

memory, with hypersensitives focusing on internal/peripheral information and hyposensitives on external/central information. If recall engenders ANSA, the attentional bias will be even more pronounced. Consequently, over-repeated recalls, peripheral and central information becomes differentially resistant to the effects of decay.

As noted previously, neurocognitive functioning affects all stages of memory. At retrieval, the impact of deficits is likely to become increasingly pronounced over time and retellings, again highlighting the urgency in seeking eyewitnesses' accounts. In the intellectually impaired, event-related distortions should be relatively more pronounced for abstract/subjective details (e.g., assumptions or interpretations, such as intentions, motivations, and social dynamics) than concrete/objective details (e.g., facts such as who did what).

Psychological variables

Psychological variables exert their impact on when, why, and how recall occurs. For example, decay for high-intensity events, such as violence, will be affected by rehearsal (to self or others). If the violence was reactive or otherwise ego-dystonic in nature, the individual is unlikely to be intrinsically motivated to broach the topic, especially details of a shameful nature, thus weakening memory trace over time. If, however, the motivation was instrumental and/or ego-syntonic, the individual may relish the experience, thereby strengthening memory trace. Personality and psychiatric status will also affect recall motivation, as well as sensitivity to external recall incentives, post-event coping strategies, response style, and the cognitive filters through which memory is reconstructed (e.g., Christianson et al., 1996; Cooper, 2005; Porter, Birt, & Yuille, 2000) – all of which influence memory reconstruction, with distortions augmenting over-repeated recalls.

Affect at recall, which may partly be delineated by one's pre-recall affective state (as discussed in the predisposing section), is also important as it can cue memory, as seen in mood-dependent research. However, emotional reactions at the time of recall may also bias memory retrieval and, consequently, distort memory reconstruction, presumably more so for hyper- than hyposensitives. Investigators should therefore aim to induce as little of an emotional reaction at recall as possible.¹⁴ Of note, despite their often dramatic presentation, psychopaths and other hyposensitives are not likely to be overtaken by affect during interviews and, thus, will not be subject to such effects.

¹⁴ Confrontational interviewing techniques are therefore counter-indicated when seeking eyewitness accounts.

Given the evidence that the commission of ego-dystonic offences can lead to post-traumatic stress responses in offenders (Pollock, 1999), and such responses effect memory processes (Cooper, 2005), enquiring about such responses and their precipitants (e.g., dissociation) is crucial. On the one hand, individuals may attempt to actively avoid thinking of the event proper (a symptom of PTSD) by consciously avoiding peripheral cues of moderate affective intensity that could lead to recall of central, traumatising memories. If successful, this coping strategy could result in fewer memory triggers for the 'feared' event being available for reconstruction over time and, therefore, to active forgetting, with subjectively central information decaying faster than peripheral information. On the other hand, a PTSD response may lead to intrusive thoughts and/or flashbacks about the event that results in ANSA of an intensity and quality similar to that experienced during the event (APA, 1994).¹⁵ In hypersensitives, such added arousal may be overwhelming, thereby engendering active forgetting or, in its extreme, post-event dissociative amnesia. Unlike encoding-based amnesic processes that result in the complete lack of encoding of event-related information, retrieval-based amnesic patterns would reflect the cognitive dissociation of the memory's sensory narrative connections leaving both, however, intact in storage (van der Kolk et al., 1996). Presumably, the information loss resulting from the latter reaction might be retrievable following, for example, successful and carefully conducted treatment. In the hyposensitive, however, the intrusion-related arousal might never become unbearable. As such, every recollection is accompanied with a manageable level of arousal that serves to enhance memory (quantity), thereby suggesting another pathway to remarkable memories. However, given the unique cognitive filters ascribed by such factors as personality, some distortion (quality) is unavoidable over time since traumatised individuals, needing to make sense of their experience, must reconstruct their memories as they see fit until they can safely integrate them within their world view.

Indeed, the manner by which individuals cope with their experiences can have significant effects on memory. For example, substance abuse, a common phenomenon in the offender context, may serve to blunt one's affective response to event-related memories, facilitate memory avoidance or add unique filters through which events are recalled, with the first two weakening the memory trace and the last distorting its quality.

¹⁵ Theoretically, memory intrusiveness could reflect either sensory or narrative information (van der Kolk et al., 1996), with hypersensitives being more susceptible to the former and hyposensitives to the latter.

Social factors

While culture and gender socialisation are likely to delineate, for example, the type of information one is willing to share, response to authority figures, response style and one's reaction to particular recall contexts (e.g., investigative vs therapeutic), little is known about these moderating factors. The recall context, however, will impact what type of information is sought and, thus, what is recalled. For example, investigative interviews, in which the aim is to elicit an account of a crime, are focused solely on event-related information, while therapeutic encounters, in which the motivation is successful treatment, are equally focused on event and sensory related information, if not more so on the latter. Unfortunately, these contexts solidify different types of memories, leaving other memories vulnerable to the effects of decay and/or suggestibility. In addition, recall motivations, which can vary from ego-syntonic to ego-dystonic and from truthful to deceitful, are likely to be accompanied with their own emotional and cognitive reactions, which can serve to further contaminate memory.

The manner in which memories are elicited is also critical. For example, the negative impact of leading questions is well established (Bruck, Ceci & Hembrooke, 1998). In addition to jeopardising criminal investigations, leading interviews facilitate memory distortions. Several investigators have been able to implant (false) emotional memories (Loftus & Pickrell, 1995), highlighting the malleability of memory, particularly in suggestible individuals. For example, research indicates that introverted individuals with a dissociative disposition who are interviewed by extroverted interviewers that utilise suggestive/leading questions are most likely to fall prey to the 'creation' of memories (Porter, Yuille, & Lehman, 1999). Biased interviewing techniques are especially likely to negatively impact the quantity and quality of accounts provided by neurocognitively impaired individuals, not because they are necessarily more suggestible but because of the functional consequences of their impairments (e.g., poor language comprehension leading to misunderstandings; tendency to mask deficit – not ask for clarification) and of biased interviewing approaches (e.g., induces ANSA that disrupts already taxed cognitive functioning and increases the likelihood of affect-mediated memory distortions). Given the positive effects of cued recall on memory (Fisher & Geiselman, 1992), the use of this strategy is, however, likely to facilitate memory reconstruction, especially in the neurocognitively impaired, but only if unbiased interviewing techniques are adopted (e.g., leading questions are avoided; cued recall is used once an uninterrupted free narrative is provided; Fisher, 1995; Yuille, Marxsen & Cooper, 1999).

Time-based forgetting suggests a positive correlation between retrieval delay and suggestibility. The type of information an individual will be suggestible to will likely depend on his/her arousal sensitivity. Recall that dissociative experiences disrupt the encoding of central information in hypersensitives and of sensory/peripheral information in hyposensitives. Accordingly, while the hypersensitive, given his/her access to sensory/peripheral information, will be suggestible to central information (Table 2.2), the hyposensitive, given his/her relatively intact memory for central information, is more likely to be suggestible to sensory/peripheral information (Table 2.2). Arousal sensitivity would further dictate that hypersensitives become suggestible at lower and across a wider range of arousal levels than hyposensitives (i.e., have a larger suggestibility window; Table 2.2).

While hypersensitives are less likely than hyposensitives to be intrinsically motivated to recall their crimes, offenders are nevertheless routinely required to provide accounts of their offences throughout their involvement with the criminal justice system. A unique feature of this context is that inaccuracies in central information can often be corrected in light of collateral information. Consequently, if elicited in an unbiased manner, offenders' memories for their crimes should evidence a relative resistance to decay, with the hypersensitive's account becoming increasingly less detailed (i.e., loss of peripheral information but retention of the gist of the offence and context-pertinent details [e.g., risk-related]) and that of the hyposensitive's evidencing good retention of central information but variable retention of peripheral details (i.e., peripheral details will reflect personality based response style [e.g., theatrical] and context-induced motivations [e.g., positive impression management]). More generally, however, externally motivated recall with a potential for negative outcome (e.g., police interrogations leading to loss of personal freedom; therapeutic inducement of memory that person is not ready to cope with) will engender significant ANSA, doing so more intensely for hyper- than hyposensitives, resulting in pronounced retrieval-based attentional biases.

Of course, offenders may also consciously distort their version of events in their attempts to escape justice and/or protect accomplices, a factor mediated by personality (O'Connell, 1960; Parwatikar, Holcomb, & Menninger, 1985; Porter, Birt, Yuille & Hervé, 2001). Unfortunately, such distortions, given the reconstructive nature of memory, may become memory reality and, therefore, reduce the accuracy of both central and peripheral information. Just as active forgetting can lead to memory decay, active confabulation can lead to memory strengthening.

IMPLICATIONS FOR RESEARCH AND PRACTICE

In relation to methodological issues, the proposed model suggests the involvement of different mechanisms within analogue and field studies. On the one hand, laboratory experiments, which induce low-to-moderate levels of arousal, may not engender any affect-related memory impairments. Studies that require recall of emotional scenes will engage a cognitively initiated emotional reaction of little-to-no ANS value and, therefore, observed-memory effect will generally reflect interpretative differences – especially in hyposensitives (e.g., Christianson et al., 1996), suggesting such studies are most useful in unravelling the variables that influence interpretations (e.g., learning history, mental ability, affective focus, personality, psychiatric status). Studies that employ mock witness scenarios that oblige participants to experience rather than interpret an event, should, however, induce some ANSA (albeit of a moderate intensity at best) and, therefore, ANSA-mediated memory effects (e.g., orientation response). In this case, arousal sensitivity will have an impact, albeit a limited one, with hypersensitives being more likely than hyposensitives to display emotion-mediated memory distortions. However, these distortions will reflect different aspects of the arousal continuum than predicted in naturalistic settings (low/moderate vs intense/traumatic), which – according to the Yerkes–Dodson law – should result in a reversal in attentional foci. That is, as arousal decreases, hypersensitives should become increasingly focused on central/external events and hyposensitives on peripheral/internal ones (Table 2.2). While typical analogue paradigms have demonstrated the former, the latter will require new methodologies to be investigated (e.g., creating an eyewitness paradigm within a sensory deprivation environment).

On the other hand, field and archival studies deal with intense, personally relevant situations that result in emotional reactions that include *both* potent ANS reactions and considerable cognitive processing that significantly affects memory. Since the effects investigated in field and archival research reflect the combination of a greater number of factors (predisposing, precipitating, and perpetuating biopsychosocial influences) than that investigated in the laboratory, each of which potentially varies from one witness to the next, naturalistic studies should result in more heterogeneous memory outcomes than laboratory studies. That is, one should expect a great deal of consistency both within and between laboratory studies and a great deal of variability both within and between field studies, which appears to be the case. Accordingly, while the generalisability of analogue research is inherently limited, the external validity of such

research can be increased by forcing participants to experience rather than evaluate to-be-remembered events, using complex paradigms in which the influence of many factors are concurrently evaluated, and developing individualised ANSA-inducing stimuli (i.e., of personal relevance), the latter of which being effectively used in the study of memory for phobic objects (Radomsky & Rachman, 2004).

The proposed theory suggests that the assessment of eyewitness memory requires more than an examination of the amount and accuracy of information provided. As developed throughout this chapter, there are a host of variables that influence the quantity and quality of memory. Inherent in our theory is the view that emotional reactions are both dynamic and subjective in nature and, as such, so is memory. Thus, any understanding of affect-mediated responses has to be considered from the vantage point of the witness. The implications are two fold. First, central and peripheral information will be subjectively defined, only periodically in a manner analogous to the investigator. Second, memory patterns should be expected to change over time. Indeed, a witness with an initial remarkable memory may later develop dissociative amnesia for the same event. Obviously, certain changes in memory patterns should be viewed more cautiously than others. For example, the truthfulness of an offender who states that he/she has developed a remarkable memory although having previously reported that he/she dissociated into event-unrelated fantasy at the time of the offence should be questioned.

Whether in research or practice, we strongly recommend investigative interviews to focus upon, not only on the memory in question, but on the following variables: the individual's arousal sensitivity, neurocognitive strengths and weaknesses, personality, psychiatric history (including past traumas), and dissociative disposition; if the individual was under the influence of drugs/alcohol at the time of the event and, if so, the type and quantity; the level of arousal and type of affect (positive to traumatic) experienced during the event and whether or not this changed as the event unfolded; if the individual dissociated at the time of the event or experienced any other psychiatric symptoms (e.g., panic attack); if there was a time in which the individual was unable to recall all or part of the event; if the individual has/had PTSD in relation to the event; if the individual made efforts to avoid thinking about the event and/or used other coping strategies (e.g., substance abuse); the number of previous recalls (to self and others); the individual's affective state at recall (s); and the recall context(s). Each of these factors will impact eyewitness memory and influence the eyewitness' recall capacity.

In terms of credibility assessment, the pattern of memory that a witness reports should be predictable based on the proposed model (Table 2.2), with the range of memory patterns anticipated being predicted by predisposing factors, the evidenced pattern(s) making sense in light of precipitating factors, and deviations being explained by perpetuating factors (Figure 2.5). Otherwise, the credibility of the witness' account should be questioned. In other words, while a borderline claiming poor memory for a reactive act of violence is explainable, a psychopath claiming poor memory for a highly rewarding instrumental crime should raise concern.

CONCLUSION

The present chapter outlined a 'working' biopsychosocial model of eyewitness memory adapted for the offender context. Unlike previous theories, this model assumes that emotional reactions are not unidimensional and static but multidimensional and dynamic, reflecting both physiological and cognitive processes. It is proposed that eyewitness memory variability results from individual differences in both of these emotional processes, differences moderated/mediated by a variety of interacting predisposing, precipitating and perpetuating biopsychosocial factors. Various memory predictions were put forward, predictions that attempted to explain the memory variability across and within witnesses in field/archival research, as well as the mechanisms leading to different findings between analogue and naturalistic research.¹⁶ Obviously, much more research is needed in this area and, consequently, this model and its predictions remain speculative. This is, in part, why this model is referred to as a 'working' model. We not only expect but invite our peers to comment and criticise this theory, either in part or in whole, as our primary goal was to generate discussion regarding how to integrate various research findings, findings that have typically been heatedly debated.

AUTHOR NOTE

The views expressed are those of the authors, and do not necessarily reflect the position of the Forensic Psychiatric Services Commission.

¹⁶ These were not meant to be exhaustive but, instead, to exemplify the manner in which the model should be applied.

Preparation for this article was supported, in part, by doctoral fellowships to the first and second authors and an operating grant to the third author from the Social Sciences and Humanities Research Council of Canada (SSHRC). The authors are grateful to Kristin Kendrick, Dorothee Griesel and Caroline Greaves for their helpful comments on earlier drafts of this chapter, as well as Dr Sven Christianson and anonymous reviewers for their constructive feedback. Separate parts of this paper were presented at the Canadian Psychological Association's 2002 Annual Convention, the Society for Applied Research on Memory and Cognition's 2003 Conference, and the Society for the Scientific Study of Psychopathy 2005 Conference.

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CHAPTER 3

An Investigation of Violent Offenders' Memories for Instrumental and Reactive Violence

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This chapter provides an overview of part of a recently completed study of eyewitness memory in a sample of violent crime perpetrators (Cooper, 2005). Founded in a biopsychosocial theory of eyewitness memory (Hervé, Cooper & Yuille, Chapter 2, this volume), a number of variables empirically and theoretically associated with eyewitness recall were examined. In the following sections, the relevant background literature to this study is reviewed. First, the importance and uniqueness of investigating offenders' eyewitness memories for violence is reviewed. Second, an overview of different types of violence is presented including their relevance to recall. Third, the relevant literature on offenders' memories of violence is discussed. Finally, the method, results and discussion are presented.

As discussed by Christianson (Chapter 1, this volume), the investigation of offenders' memories for their violent crimes is of central