Memory in the Courtroom: What Every Attorney Should Know

A Presentation for the State Bar of Arizona, June 15, 2015

Dr. Paul Simpson, Forensic Psychologist
(520) 355-1000, crimeshrink@gmail.com
www.drpaulsimpson.com

Memory in the Courtroom: What Every Attorney Should Know

A Presentation for the State Bar of Arizona, June 15, 2015

Dr. Paul Simpson, Forensic Psychologist
(520) 355-1000, crimeshrink@gmail.com

I. PRINCIPLES OF MEMORY

Excerpts from Raymond Phinney: "*Malleability of Memory: Evaluating Testimony and Accusations within the Mission Community*." (unpublished article as of 11/13).

Memory is a vital function supporting learning, consciousness, cognition and behavior. Yet most people have little grasp of how memory works, its real purpose, or how remembered information relates to actual past events. Most laypersons believe memory functions to provide conscious knowledge of the past. Memory researchers, however, view memory as guiding current behavior based on past experience. Conscious knowledge may be a side effect, or one means to achieve behavioral guidance, but is not the real objective of the system. From this viewpoint, forgetting and other memory "failures" illuminate normal function in the same way visual illusions reveal normal visual function. They are not mere inefficiencies but are the infrequent down-side of powerful heuristics that guide current behavior with minimal load on working memory and attention.

Most laypersons over-apply the popular computer model of memory. They believe encoding is encyclopedic and very detailed. They also believe "storage" is static retention of information, largely unchanged until recalled. Further, they believe that recall is mainly determined by the past events. Research indicates otherwise.

Attentional limits dictate that we encode little of our experience. "Storage" is not static, as on a hard drive. Our memory is updated after-the-fact with context and real world knowledge to improve future behavior. This updating often protects us from harm, but does not always increase accuracy. It can, under some conditions, result in forgetting or in false memory of details or entire events that never occurred. Finally, recall depends on one's current context as much or more than on the past events themselves. Recall is not a search for the exact reproduction of an event. It is a reconstruction of the event based on fragments of encoded, updated, and inferred information, subject to constraints of the recall situation.

This misunderstanding of memory leads to poor evaluation of memories in certain instances. For example, humans tend to believe a vivid detailed, emotional accusation is either accurate or else fabricated. They do not consider the third possibility: Reasonable, normal people can have detailed, vivid memories they firmly believe, which are nonetheless entirely (or partially) false, even concerning important events and issues. To understand how this might occur, let us review memory function.

Memory Overview

Encoding

Most information is only encoded while directly attended, with our limited-capacity attention system. The Illinois Door Study[1] demonstrates how surprisingly little we actually encode. Each subject was approached and asked directions by an experimenter. Two confederates then carried a door between the conversants. Another confederate changed places with the experimenter as the door passed, and continued the conversation. Half the subjects did not notice the mid-conversation person change! Apparently, we often encode only basic information such as "direction asker" about people. We may not notice clothing, height, and hairline change because they were not attended. Subsequent studies indicate that we notice such changes, given an

adequate hint soon enough after the switch, but that information decays quickly.[2] Only information that is attended and rehearsed is ultimately translated into semantic information (meaning) for later recall.

Repetition powerfully strengthens memories but has diminishing returns. Each repetition adds less strength than the last.[3] More processing is better, but the type of processing is also critical in determining memory strength. In the "levels of processing" theory, "deeper" cognitive processes support better memory.[4] Craik and Tulving had participants judge words in a list and then administered an unexpected memory test for the words.[5] Those judging visual appearance (e.g. "Is this word in all capitals?) remembered few words. Acoustic judgments ("Does this word rhyme with dog?") yielded better memory. Semantic judgments (e.g. "Does this word complete the sentence?") yielded the best memory. **Memory seems to be optimized to retain meaning, not the sensory information itself.** Deeper (semantic) processes improve memory regardless of whether the subject intends to remember. Motivation effects do not directly affect recall. Rather, higher motivation causes more and deeper processing, improving recall.

Encoding is thus the transforming of a small subset of the sensory information from an event into a semantic code for retention. The limited nature of encoding necessitates updating in storage and reconstruction at recall to yield a complete narrative of past events.

Storage

Information is not simply warehoused between encoding and retrieval, but updated. **Originally encoded information is supplemented with information from later similar events, others' accounts of that or similar events, mentally reliving the event, or even imagining such events.** All possible sources of information are used to make a memory as detailed and accessible as possible for later use.

Storage is semantically organized. Information about a certain meaning is stored together, regardless of when the different information was obtained. So we often "remember" experiencing something during our first exposure to an event, even if we only learned about that facet of the event later.

Amnesia studies have revealed much about memory. Bilateral hippocampal damage leaves patients unable to form new **declarative memories** after the injury. Memory for days to decades predating the damage is impaired, depending on severity of the damage. Earlier memories are unimpaired. Thus, post-injury events and the more recent pre-injury events cannot be consciously recalled. However, **non-declarative memory** – skills, habits, conditioning, and priming which do not require conscious recall – is typically unaffected.[6] These results indicate the hippocampus is essential to declarative memory encoding and is also required for conscious recall until the memory is fully consolidated, days to decades after the event.[7] However, the hippocampus does not itself hold those memories. **Memory elements are distributed throughout cortex; visual elements in visual cortex, auditory information in auditory cortex, etc. The hippocampus consolidates, or binds those elements together for later combined recall.**

In addition to consolidating a single event, the hippocampus reconsolidates it each time it is recalled. **During reconsolidation the memory can incorporate new information and is therefore vulnerable to change or even deletion.** In rats, hippocampal disruption (with shock or protein synthesis inhibitors) shortly after recall destroys the memory.[8] Distraction may disrupt reconsolidation in a similar fashion, but to a lesser degree. This vulnerability, a seeming weakness, is also a strength. The lability allows incorporation of new information into the

memory. This is adaptive because one may only understand an event sometime after it occurs. Storing the later understanding with the original memory improves future responses. Without updating, memories could not incorporate new information, nor could a first impression be revised.

Non-activated memories decay or become less accessible over time. Decay is one way we forget. Rehearsing or using information builds memory strength, combating decay. Decay is functional in that unused information may be old and no longer relevant. Losing it allows concentration of limited resources on processing current, relevant information. If I remember, with equal intensity, every item I ever ran out of while at the supermarket, I would be as lost as if I had no memory. I want to best recall items depleted most recently.

Levels of processing also affect retention. **Deeper, semantic information is retained longer than shallower, sensory information.** Thus we cannot simply "replay the video" to recall events. **We retain the meanings of sensory information, but not the sensory information itself**. It decays quicker than semantic information unless carefully, explicitly rehearsed. Anderson demonstrated this differential decay.[9] Subjects read paragraphs of eight sentences, each concerning two agents and one action in either passive or active voice. Consider:

1) The painter shot the actor.
2) The actor was shot by the painter.

The action is the same in each, but 1 uses active voice and 2 uses passive voice. Paragraphs contained four active and four passive sentences. Subjects then reported which test sentences had been verbatim in the paragraph. Subjects verified both action and voice 98% correctly with no delay. With two minutes delay, subjects falsely recognized sentences in the wrong voice provided they referenced the right action. Acoustic representation of the sentences had decayed while semantic representation was still strong.

In summary, **retained information is updated, not static**. **Sensory information decays quickly, leaving mostly semantic information**. Furthermore, updating can lead to enhancement or deletion of memories. Updating can be adaptive, but can also be a source of errors. Misinformation experiments, discussed in the Reconstruction section, elucidate how such errors may occur. See the "Memory Concepts" section of this handout for a more detailed description of sensory, short-term, and long-term memory.

Retrieval

To be used, information must be retrieved, either automatically or effortfully. Much everyday recall is automatic retrieval. Semantic priming is an example whereby a stimulus (the prime) facilitates activation of a semantically related stimulus (the target). Primed targets are recognized faster than unprimed targets.[10] For instance, people recognize dog as a word more quickly following puppy (a semantically related word) than following lramn (a non-word) or blanket (a semantically unrelated word).

Priming occurs through mental associations other than semantic relation, such as temporal contiguity or even arbitrary association. Paired-list recall demonstrates this. Subjects who studied paired-lists later recalled the second word of each pair, given the first as a retrieval cue, better than they could recognize the second words in a recognition list. Recognition is typically better than recall. However, in this case, subjects' word recall exceeded recognition because the first words primed activation of the second words. Pairing the semantically unrelated words caused subjects to associate them.

Priming can even occur with no explicit pairing. After learning lists derived from certain categories, subjects remember more words when the category names are provided at recall as retrieval cues.[11] Subjects not given category names at the first recall can remember more words at a second recall if given the category names. Thus, forgotten items are often available in our memory but are not accessible at that time or under those conditions. Furnishing more effective retrieval cues can improve recall.

Priming does occur in everyday life. Seeing something often primes recall of the last time we saw it. Next, memory of related information is primed, such as whom we were with or what happened next. Looking at our old yearbook pictures primes recall of names and events we could not otherwise retrieve that day.

Context effects are strong memory phenomena that depend on temporal association. The context in which we learn an item is automatically associated with that item. When the retrieval context (environmental, mental and physical conditions) is similar to the encoding context, recall is facilitated for items encoded in that context. For instance, people who learned word lists on land or underwater remembered more words if tested in the same condition.[12] Subjects recalled more words when the encoding and recall contexts were the same (land-land or water-water conditions) than when they were different (land-water or water-land conditions).

State dependent memory yields enhanced recall when internal state (e.g. inebriation versus sobriety) **is similar at encoding and recall**.[13] In a related effect, **mood dependent memory, enhanced recall occurs when mood is similar at encoding and recall**.[14] Another mood effect, mood-congruent memory, entails enhanced recall when the items' meanings are congruent to one's current mood.[15] Depressed persons often exhibit both effects, better recalling information encoded while depressed (mood dependence) and information with a depressing meaning (mood congruence). Mood-incongruent memory, enhanced recall of items with opposite meaning from one's current mood, can occur when a professional or non-emotional demeanor is demanded. For instance, graduate students exhibited mood congruent recall at the end of class (under no demand for professional demeanor), but mood-incongruent recall at the beginning of class, when ongoing professional demeanor is expected.[16] Such mood regulation further highlights that memory is more about present behavior guidance than about conscious knowledge of the past.

These context effects strongly influence recall, highlighting the role of retrieval cues in remembering. Recall relies crucially on current environment, not just past events. **Retrieval cues and proper retrieval contexts are necessary for successful recall.** These effects can affect both automatic and effortful recall. One can try to remember past events by trying to imagine or even go to the encoding context. When the retrieval context matches the encoding context and more detail is accurately remembered, it is termed **context dependent memory**, but the recall context exerts an effect whether or not it matches the encoding context. Context effects are so strong that they can warp memory as well. In an angry state, one is more likely to remember a given event as containing angry words, for instance. One must be quite sure of the original context to accurately improve recall.

Reconstruction

The concept of retrieval usually evokes a search analogy, such as for an artifact – a detailed, accurate, unchanged representation of a past experience. No such representation exists. **Recall is not retrieval of a faithful reproduction of the event. Recall involves reconstructing the event from limited, stored information, updated information, current knowledge, and context**.

How does reconstruction fill-in the encoded, updated information with useful, accurate information? It does so through real world knowledge, for instance with invariants. Much of the perceptual information we receive remains invariant as we move through the environment. (For instance, the earth is always below, the sky above, light comes from above, etc.). Humans abstract and use such invariants to navigate and judge distances.[17] Similarly, invariants economize our information processing and storage. We need not store every aspect of an experience because certain attributes tend to covary with others. Storing them all is inefficient. Studies like the Illinois Door Study demonstrate that we store fewer details than we suppose. Reconstruction capitalizes on context and invariants to supply missing information that is usually correct. Sometimes, however, this economy leads to inaccuracy.

An example of reconstruction error is the **misinformation effect**. Loftus and Palmer had participants answer questions immediately after watching video of low-speed car crashes with no vehicle damage.[18] One group was asked to estimate the vehicles' speed as they "hit" each other. The verb for the other group was "smashed." One week later, the "smashed" group was twice as likely as the "hit" group, or a control group, to falsely report seeing broken glass at the scene. This minor wording change distorted later memory of crash severity. Reconstruction is always part of the recall process, but can only be definitively demonstrated when "recalling" details not in the original event, since any correctly remembered details could be due to accurate encoding, storage, and retrieval or from reconstruction.

People can even come to remember entirely false events such as getting lost as a child at a Disney park and being found by Bugs Bunny,[19] or seeing a non-existent video of an event they know happened – such as the No. 30 bus explosion in the 2005 London Tavistock Square bombing.[20] **False memories become even more detailed and vivid when subjects are encouraged to simply talk about whether the supposed event might have happened, as one may do in psychotherapy or recovery groups**.[21] Over successive sessions, subjects "recall" more detail and develop more emotion about the false event. Those memories then become indistinguishable from true memories as judged by the rememberer and by third parties.

Some proponents of recovered memory therapies contend these experiments do not involve the intensity and personal nature of sexual abuse. Such trauma, they argue, causes memory mechanisms to function differently, sparing it from misinformation or suggestion effects. However, there have been recent experiments using personal, threatening events (which elevated cortisol and norepinephrine and suppressed gonadal hormones) in an army mock POW camp at Survival Training School. Well trained individuals misidentified their interrogator 93% of the time when given misinformation (such as a picture or a description of an interrogator) versus 50% of the time when not misinformed.[22] Participants in the mock POW camp were physically, emotionally, and verbally abused by their interrogators under severe duress and were required to look at interrogator's faces at all times. Yet when misinformed, they could not identify them properly. Clearly stress did not spare those memories from distortion. It should be noted that the army's own estimate of unreported rapes within its ranks is about 19,000 per year.[23] Thus, any soldier might reasonably fear sexual violence at any time in service. It is therefore unlikely that the stress of the mock POW camp is categorically different than that experienced in sexual trauma.

Merely imagining an event increases false recall and increases one's confidence in the accuracy of such a memory. Garry, Manning, Loftus and Sherman gave participants life-event inventories and two weeks later asked them to imagine an event – such as falling through a window and cutting their hand.[24] Different groups imagined different events. Participants then completed a second life event inventory (they were told the first had been lost). More subjects

recalled the imagined event as real in the second inventory with no change in other reported event frequencies. **Imagination increased familiarity, which can increase belief in a statement's truth, even if the familiarity comes from mere exposure to the statement with no fact-checking**.[25]

Finally, search, retrieval, and reconstruction are shepherded by cognition. This is undoubtedly why retrieval context has such a powerful effect. Environment and internal state affect cognitive state, affecting priming and reconstruction into a full memory. Researchers refer to this as "**retrospective bias**". At retrieval, it seems the left prefrontal cortex generates possible missing information about events that are difficult to recall from simple hippocampal retrieval. Right prefrontal cortex performs plausibility checking by reconstructing the original context and filtering out possible answers that are not relevant for the given context.[26] This plausibility checking gives us a sense of how confident we are in the accuracy of a memory.

II. MEMORY "*FAILURES*"

False and distorted recall due to misinformation is but one kind of memory error. Daniel Schacter has classified memory failures into seven "sins" of memory.[27] **Transience, absentmindedness, and blocking are sins of omission or forgetting. Suggestibility, bias, misattribution, and persistence are sins of commission in which something is remembered intrusively or inaccurately.** Schacter argues these "sins" are not errors, but rather the infrequent down-sides of adaptive trade-offs that give us efficient, useable memory systems. They indicate that memory's function is not to produce conscious access to detailed knowledge of our past but to guide current behavior using past experience without exhausting limited resources of attention and information processing. Systematic study of these failures illuminates normal memory function the same way study of visual illusions informs us about visual function.

Transience is the loss of unused, old information via decay. As mentioned in the Storage section, such loss is useful when the information is no longer accurate. Interestingly, decreased likelihood of recalling old, unused information mirrors the actual probability with which information recurs in the environment. Anderson and Schooler found the probability of words recurring in the New York Times and in emails in a database followed the same mathematical function as human recall probability over a similar retention interval. Our forgetting curve seems to yield optimal adaptation to the environment.[28]

Absent-mindedness is forgetting information that was not properly attended at encoding. Settling an argument between my kids upon arriving home interrupts my normal arrival routine and I may not place my keys in the usual place. My diverted attention is not on key placement, which is quickly forgotten. This seems a failure but points out an efficient rule. Given limited processing capabilities, it is best to limit and prioritize what is actually encoded and stored. Unattended information is often unimportant and unlikely to be useful later. The downside? If I am distracted, something may be unattended and not be properly encoded.

Blocking is failure to recall encoded information such as the inability to put a name to a familiar face. This often occurs for someone we have not met or thought of recently. Given limited resources, it is best to prioritize strengthening only activated memories. Transience is the downside of maintaining only information that is most current. Absent-mindedness is the down side of selective encoding, and blocking shows that some information is less accessible as it gets old or unused.

Suggestibility is distortion of a memory based on post-event misinformation. It is the downside of updating. Improving memory with post-event information can improve one's response to

future events. This is the adaptive genius of a semantically organized system with reconsolidation and updating. Post-event information usually further clarifies what happened or how to respond in future instances. Sometimes, however, post-event information can be misleading as in the Loftus and Palmer study. An inference from a single word change in post-event questions was stored with the representation of the actual collision, since both concerned the same event. This led to distorted recall later.

Misattribution is attributing information to the wrong source. Suggestibility in the Loftus and Palmer study was caused by misattributing the source of the inference. It came from the word "smashed" in a post-event question, but was attributed to observation of the accident. Similarly, leading questions, poor interviewing technique, and repeated interviewing can distort eyewitness testimony. Even careful questioning may cause distortions. The effect has been shown for a single word that was not in a statement but in an inquiry. Misattribution is one reason that imagination inflation occurs and some false memories form. In recall following imagination, subjects misattribute images from the imagination task as having occurred at an actual event. Researchers refer to this as "**source monitoring errors**".

Bias is memory distortion due to one's expectations. Since memory is semantically organized, the similar meaning of one's expectations and one's actual observations at an event are difficult to separate in later recall. Sometimes, one's understanding of what occurred at an event is based on one's erroneous expectations. The belief is misattributed as due to observations at that event, when it is really due to pre-event expectations, not something that actually occurred. Also, expectations guide attention. Proper expectation leads to a focus on the most important things, facilitating memory for them. Misplaced expectations can bias one's memory for the meaning or details of an event, especially complex or vague events that lack clear constraints that could direct attention to the most important information.

Persistence is intrusive, unwelcome, recall, such as occurs in post-traumatic stress disorder (PTSD). It also occurs after non-life-threatening stresses such as an office argument. Afterwards, mining that experience to optimize future responses to comparable situations is quite functional. This involves thinking about, analyzing, and modeling how things might have gone differently. The possible downside to reliving these experiences is that some people in some conditions experience stressful over-arousal while reliving the event. Rather than habituating to the trauma, they are sensitized to it. The prevalence of PTSD indicates that trauma most commonly triggers persistence, not repression or forgetting. In fact, contrary to many memory recovery proponents' claims, sexual trauma is not more easily forgotten than other events. It is by far better remembered, especially if it is violent, significant, or repeated over time.[29]

Schacter declares that these "sins," taken together, are not failures of the system, but rather the costs of an adaptive and efficient system.[30] If the system's purpose were encyclopedic knowledge of one's past, then it is inefficient and untrustworthy at points. But reverse engineering the system through studying memory capabilities and limits indicates its purpose is rather to guide present behavior using knowledge from previous events, whether it is conscious and effortful or automatic.

Consequences for remote autobiographical memory

So what does all this mean for ones memory of one's own past? **There are two types of long-term declarative (conscious) memory: semantic and episodic. Semantic memory concerns facts we know. Episodic memory concerns the episodes of our life and the flow of events within them.** I remember that Columbus sailed westward through the Atlantic on the Nina, the Pinta, and the Santa Maria. This is a semantic memory. I also remember my kindergarten

teacher telling the story as we colored a picture of 3 ships on the sea. That is an episodic memory. I can choose to think about either and thus rehearse them, but whereas I can verify the truth of the ship names, I cannot really verify all the details of what happened in class that day. Thus, rehearsal can have a very different effect on semantic than on episodic memory. **Semantic memory is less susceptible to distortion through misinformation, suggestion, and context effects. Episodic memory is typically less often and less reliably rehearsed than semantic memory**.

For instance, when asked what I did on the morning of September 11, 2001, I have some idea because I thought about and told others about those events repeatedly just after they occurred and sporadically since. However, when asked about September 10, 2001, I really have no clear memory of that. I do not recall ever recounting those events to anyone. Likely, no one ever asked. Although my 9/11 memory got more rehearsal than my 9/10 memory, is the former more accurate than any other (well rehearsed) memory? It is an example of a flashbulb memory, memory for an important and emotional event.

The vividness of such long-past memories was once thought to demonstrate their accuracy and permanence.[31] However, such recall has since been repeatedly demonstrated to be malleable. Change has been demonstrated regarding the announcement of the O.J. Simpson murder verdict,[32] the Challenger space shuttle explosion,[33] and 9/11 terrorist attack.[34] **Participants' narratives concerning how they heard, who told them, where they were when they found out, and other central information (as well as details) changed over a 9 to 18 month period. Even though the stories changed, participants expressed very high confidence in their accuracy.**

Why do these stories change if they are so important to us and we retell them all the time? Marsh says retelling is not the same as recalling.[35] Retelling of an event is aimed to affect the listener, not practice complete and accurate recall. A retelling may omit details that are "boring," complicate the story, negatively characterize the speaker, or otherwise detract from the desired effect. Untold details are rehearsed less and may become irretrievable. The speaker may then reconstruct details if asked questions about missing information. The reconstructed details may be items for which the reteller has source amnesia and has misattributed to that event. Some details may be overemphasized, leading to later exaggeration of details or of the importance of one event versus another. Or, the speaker may misattribute and remember some aspect of a retelling as being something that actually occurred in the event**. Thus, one is much more likely to be inaccurate about episodic than semantic information. Without the ability to verify the facts, an often retold or remembered story can change, even on the main points.**

References

[1] Daniel J. Simons and Daniel T. Levin, "Failure to Detect Changes to People During a Real-world Interaction," *Psychonomic Bulletin & Review* 5, no. 4 (December 1998): 644–649, doi:10.3758/BF03208840.

[2] Daniel J Simons et al., "Evidence for Preserved Representations in Change Blindness.," *Consciousness and Cognition* 11, no. 1 (March 2002): 78–97, doi:10.1006/ccog.2001.0533.

[3] PL Pirolli and JR Anderson, "The Role of Practice in Fact Retrieval," *Journal of Experimental Psychology: ...* 11, no. 1 (1985): 136–153.

[4] Fergus I. M. Craik and Robert S. Lockhart, "Levels of Processing: A Framework for Memory Research," *Journal of Verbal Learning and Verbal Behavior* 11, no. 6 (1972): 671–684.

[5] Fergus I. M. Craik and Endel Tulving, "Depth of Processing and the Retention of Words in Episodic Memory.," *Journal of Experimental Psychology: General* 104, no. 3 (1975): 268–294, doi:10.1037/0096-3445.104.3.268.

[6] LR Squire and SM Zola, "Structure and Function of Declarative and Nondeclarative Memory Systems," *Prceedings of the National Academy of Sciences* 93, no. November (1996): 13515–13522.
[7] Larry R Squire, Craig E L Stark, and Robert E Clark, "The Medial Temporal Lobe," *Annual Review of Neuroscience* 27 (January 2004): 279–306, doi:10.1146/annurev.neuro.27.070203.144130.
[8] Natalie C Tronson and Jane R Taylor, "Molecular Mechanisms of Memory Reconsolidation.," *Nature Reviews. Neuroscience* 8, no. 4 (April 2007): 262–75, doi:10.1038/nrn2090.
[9] John R. Anderson, "Verbal and Propositional Representation of Sentences in Immediate and Long-term Memory," *Journal of Verbal Learning and Verbal Behavior* 13 (1974): 149–162.
[10] David E. Meyer and Roger W. Schvaneveldt, "Facilitation in Recognizing Pairs of Words: Evidence of a Dependence Between Retrieval Operations.," *Journal of Experimental Psychology* 90, no. 2 (1971): 227.
[11] E Tulving and Z Pearlstone, "Availability Versus Accessibility of Information in Memory for Words," *Journal of Verbal Learning and Verbal Behavior* 5, no. 4 (1966): 381–391.
[12] DR Godden and AD Baddeley, "Context-dependent Memory in Two Natural Environments: On Land and Underwater," *British Journal of Psychology* 66, no. 3 (1975): 325–331.
[13] Donald W. Goodwin et al., "Alcohol and Recall : State-dependent Effects in Man," *Science* 163, no. 3873 (1969): 1358–1360.
[14] Eric Eich, "Searching for Mood Dependent Memory," *Psychological Science* 6, no. 2 (1995): 67–75.
[15] P H Blaney, "Affect and Memory: a Review.," *Psychological Bulletin* 99, no. 2 (March 1986): 229–46.
[16] Gerrod Parrott and Matthew P Spackman, "Emotion and Memory," in *Handbook of Emotions*, ed. Michael Lewis and Jeanette Haviland-Jones, 2nd ed. (Guilford, 2000), 476–490.
[17] J J Gibson, *Perception of the Visual World*, *1950* (Houghton Mifflin, 1950).
[18] Elizabeth F. Loftus and John C. Palmer, "Reconstruction of Automobile Destruction: An Example of the Interaction Between Language and Memory," *Journal of Verbal Learning and Verbal Behavior* 13 (October 1974): 585–589, doi:10.1016/S0022-5371(74)80011-3.
[19] KA Braun, R Ellis, and EF Loftus, "Make My Memory: How Advertising Can Change Our Memories of the Past," *Psychology and Marketing* 19, no. January 2002 (2002): 1–23.
[20] James Ost et al., "Familiarity Breeds Distortion: The Effects of Media Exposure on False Reports Concerning Media Coverage of the Terrorist Attacks in London on 7 July 2005.," *Memory (Hove, England)* 16, no. 1 (January 2008): 76–85, doi:10.1080/09658210701723323.
[21] Lauren French, Rachel Sutherland, and Maryanne Garry, "Discussion Affects Memory for True and False Childhood Events," *Applied Cognitive Psychology* 20, no. 5 (July 2006): 671–680, doi:10.1002/acp.1219; Stefanie J. Sharman, Charles G. Manning, and Maryanne Garry, "Explain This: Explaining Childhood Events Inflates Confidence for Those Events," *Applied Cognitive Psychology* 19, no. 1 (January 2005): 67–74, doi:10.1002/acp.1041; Christopher M. Heaps and Michael Nash, "Comparing Recollective Experience in True and False Autobiographical Memories.," *Journal of Experimental Psychology: Learning, Memory, and Cognition* 27, no. 4 (2001): 920–930, doi:10.1037//0278-7393.27.4.920.
[22] C A Morgan et al., "Misinformation Can Influence Memory for Recently Experienced, Highly Stressful Events.," *International Journal of Law and Psychiatry* 36, no. 1 (2013): 11–7, doi:10.1016/j.ijlp.2012.11.002.
[23]Msnbc com Staff and News Services, "Panetta: Could Be 19,000 Military Sex Assaults Each Year," *NBC News*, January 18, 2012, http://usnews.nbcnews.com/_news/2012/01/18/10184222-panetta-could-be-19000-military-sex-assaults-each-year.
[24] Maryanne Garry et al., "Imagination Inflation: Imagining a Childhood Event Inflates Confidence That It Occurred," *Psychonomic Bulletin & Review* 3, no. 2 (1996): 208–214.
[25] Larry L. Jacoby, Jeffrey P. Toth, and Andrew P. Yonelinas, "Separating Conscious and Unconscious Influences of Memory: Measuring Recollection.," *Journal of Experimental Psychology: General* 122, no. 2 (1993): 139–154, doi:10.1037//0096-3445.122.2.139.
[26] D L Schacter, "Illusory Memories: a Cognitive Neuroscience Analysis.," *Proceedings of the National Academy of Sciences of the United States of America* 93, no. 24 (November 26, 1996): 13527–33.
[27]Daniel L. Schacter, *The Seven Sins of Memory: How the Mind Forgets and Remembers* (Houghton Mifflin Harcourt, 2002).

[28] John R. Anderson and Lael J. Schooler, "Reflections of the Environment in Memory," *Psychological Science* 2, no. 6 (November 1991): 396–408, doi:10.1111/j.1467-9280.1991.tb00174.x; John R Anderson and Lael J Schooler, "The Adaptive Nature of Memory.," in *Handbook of Memory,*, ed. Endel Tulving and F. I. M. Craik (New York: Oxford University Press, 2000), 557–570.

[29] Deborah Davis and Elizabeth Loftus, "The Scientific Status of 'Repressed' and 'Recovered' Memories of Sexual Abuse," in *Psychological Scence in the Courtroom: Consensus and Controversy*, ed. Jennifer L Skeem, Kevin S Douglas, and Scott O Ulienfeld (New York, NY: Guilford Press, 2009), 55–79.

[30] Daniel L Schacter, Scott a Guerin, and Peggy L St Jacques, "Memory Distortion: An Adaptive Perspective.," *Trends in Cognitive Sciences* 15, no. 10 (October 2011): 467–74, doi:10.1016/j.tics.2011.08.004; Daniel L. Schacter, Joan Y. Chiao, and Jason P. Mitchell, "The Seven Sins of Memory," *Annals of the New York Academy of Sciences* 1001 (2003): 226–239, doi:10.1196/annals.1279.012; Schacter, *The Seven Sins of Memory: How the Mind Forgets and Remembers*.

[31] Roger Brown and James Kulik, "Flashbulb Memories," *Cognition* 5, no. 1 (January 1977): 73–99, doi:10.1016/0010-0277(77)90018-X.

[32] H Schmolck, EA Buffalo, and LR Squire, "Memory Distortions Develop over Time: Recollections of the OJ Simpson Trial Verdict after 15 and 32 Months," *Psychological Science* no. August 1998 (2000): 39–45.

[33] Ulric Neisser and Nicole Harsch, "Phantom Flashbulbs: False Recollections of Hearing the News About Challenger.," in *Affect and Accuracy in Recall*, ed. Eugene Winograd and Ulric Neisser (New York, NY: Cambridge University Press, 1992), 9–31.

[34] JM Talarico and DC Rubin, "Confidence, Not Consistency, Characterizes Flashbulb Memories," *Psychological Science* 14, no. 5 (2003): 455–461.

[35] EJ Marsh, "Retelling Is Not the Same as Recalling: Implications for Memory," *Current Directions in Psychological Science* 16, no. 1 (2007): 16–20.

III. Special Topics in Memory

TOPIC: Stages of Memory

The following text borrows extensively from Wikipedia, which offers a helpful synopsis of ***stages of memory***.

Perception

Perception (from the Latin *perceptio, percipio*) is the organization, identification, and interpretation of sensory information in order to represent and understand the environment. All perception involves signals in the nervous system, which in turn result from physical or chemical stimulation of the sense organs. For example, vision involves light striking the retina of the eye, smell is mediated by odor molecules, and hearing involves pressure waves. Perception is not the passive receipt of these signals, but is shaped by learning, memory, expectation, and attention.

Perception involves these "top-down" effects as well as the "bottom-up" process of processing sensory input. The "bottom-up" processing transforms low-level information to higher-level information (e.g., extracts shapes for object recognition). The "top-down" processing refers to a person's concept and expectations (knowledge), and selective mechanisms (attention) that influence perception. Perception depends on complex functions of the nervous system, but subjectively seems mostly effortless because this processing happens outside conscious awareness.

Since the rise of experimental psychology in the 19th Century, psychology's understanding of perception has progressed by combining a variety of techniques. Psychophysics quantitatively describes the relationships between the physical qualities of the sensory input and perception. Sensory neuroscience studies the brain mechanisms underlying perception. Perceptual systems can also be studied computationally, in terms of the information they process. Perceptual issues in philosophy include the extent to which sensory qualities such as sound, smell or color exist in objective reality rather than in the mind of the perceiver.

Although the senses were traditionally viewed as passive receptors, the study of illusions and ambiguous images has demonstrated that the brain's perceptual systems actively and pre-consciously attempt to make sense of their input. There is still active debate about the extent to which perception is an active process of hypothesis testing, analogous to science, or whether realistic sensory information is rich enough to make this process unnecessary.

The perceptual systems of the brain enable individuals to see the world around them as stable, even though the sensory information is typically incomplete and rapidly varying. Human and animal brains are structured in a modular way, with different areas processing different kinds of sensory information. Some of these modules take the form of sensory maps, mapping some aspect of the world across part of the brain's surface. These different modules are interconnected and influence each other. For instance, the taste is strongly influenced by its odor.

Sensory Memory

During every moment of an organism's life, sensory information is being taken in by sensory receptors and processed by the nervous system. The information people received which is stored in sensory memory is just long enough to be transferred to short-term memory. Humans have five main senses: sight, hearing, taste, smell, touch. **Sensory memory** (SM) allows individuals to retain impressions of sensory information after the original stimulus has ceased. A common demonstration of SM is a child's ability to write letters and make circles by twirling a sparkler at night. When the sparkler is spun fast enough, it appears to leave a trail which forms a continuous

image. This "light trail" is the image that is represented in the visual sensory store known as iconic memory. The other two types of SM that have been most extensively studied are echoic memory, and haptic memory; however, it is reasonable to assume that each physiological sense has a corresponding memory store. Children for example have been shown to remember specific "sweet" tastes during incidental learning trials but the nature of this gustatory store is still unclear.

SM is considered to be outside of cognitive control and is instead an automatic response. The information represented in SM is the "raw data" which provides a snapshot of a person's overall sensory experience. Common features between each sensory modality have been identified; however, as experimental techniques advance, exceptions and additions to these general characteristics will surely evolve. The auditory store, echoic memory, for example, has been shown to have a temporal characteristic in which the timing and tempo of a presented stimulus affects transfer into more stable forms of memory. Four common features have been identified for all forms of SM:

1. The formation of a SM trace is independent of attention to the stimulus.
2. The information stored in SM is modality specific. This means for example, that echoic memory is for the exclusive storage of auditory information, and haptic memory is for the exclusive storage of tactile information.
3. Each SM store represents an immense amount of detail resulting in very high resolution of information.
4. Each SM store is very brief and lasts a very short period of time. Once the SM trace has decayed or is replaced by a new memory, the information stored is no longer accessible and is ultimately lost. All SM stores have slightly different durations which is discussed in more detail on their respective pages.

It is widely accepted that all forms of SM are very brief in duration; however, the approximated duration of each memory store is not static. Iconic memory for example has an average duration of 500 ms which tends to decrease with age. The SM is made up of spatial or categorical stores of different kinds of information, each subject to different rates of information processing and decay. Genetics also play a role in SM capacity; mutations to the brain-derived neurotrophic factor (BDNF), a nerve growth factor, and N-methyl-D-aspartate (NMDA) receptors, responsible for synaptic plasticity, decrease iconic and echoic memory capacities respectively.

Iconic Memory: The mental representation of the visual stimuli are referred to as icons (fleeting images.) Iconic memory was the first sensory store to be investigated with experiments dating back as far as 1740. One of the earliest investigations into this phenomenon was by Ján Andrej Segner, a German physicist and mathematician. In his experiment, Segner attached a glowing coal to a cart wheel and rotated the wheel at increasing speed until an unbroken circle of light was perceived by the observer. He calculated that the glowing coal needed to make a complete circle in under 100ms to achieve this effect, which he determined was the duration of this visual memory store.

Echoic Memory: represents SM for the auditory sense of hearing. Auditory information travels as sound waves which are sensed by hair cells in the ears. Information is sent to and processed in the temporal lobe. The first studies of echoic memory came shortly after Sperling investigated iconic memory using an adapted partial report paradigm. Today, characteristics of echoic memory have been found mainly using a Mismatch Negativity (MMN) paradigm which utilizes EEG and MEG recordings. MMN has been used to identify some of the key roles of echoic memory such as change detection and language acquisition. Change detection, or the ability to detect an unusual or possibly dangerous change in the environment independent of attention, is

key to the survival of an organism. With regards to language, a characteristic of children who begin speaking late in development is reduced duration of echoic memory. In short," Echoic Memory is a fast - decaying store of auditory information In the case of damage to or lesions developing on the frontal lobe, parietal lobe, or hippocampus, echoic memory will likely be shortened and/or have a slower reaction time.

Haptic Memory: represents SM for the tactile sense of touch. Sensory receptors all over the body detect sensations such as pressure, itching, and pain. Information from receptors travel through afferent neurons in the spinal cord to the postcentral gyrus of the parietal lobe in the brain. This pathway comprises the somatosensory system. Evidence for haptic memory has only recently been identified resulting in a small body of research regarding its role, capacity, and duration. Already however, fMRI studies have revealed that specific neurons in the prefrontal cortex are involved in both SM, and motor preparation which provides a crucial link to haptic memory and its role in motor responses.

Working memory (Short-term)

Working memory is the system that actively holds multiple pieces of transitory information in the mind, where they can be manipulated. Working memory is generally used synonymously with short term memory, but this depends on how the two forms of memory are defined. Working memory includes subsystems that store and manipulate visual images or verbal information, as well as a central executive that coordinates the subsystems. It includes visual representation of the possible moves, and awareness of the flow of information into and out of memory, all stored for a limited amount of time. Working memory tasks require monitoring (i.e., manipulation of information or behaviors) as part of completing goal-directed actions in the setting of interfering processes and distractions. The cognitive processes needed to achieve this include the executive and attention control of short-term memory, which permit interim integration, processing, disposal, and retrieval of information. These processes are sensitive to age: working memory is associated with cognitive development, and research shows that its capacity tends to decline with old age. Working memory is a theoretical concept central both to cognitive psychology and neuroscience. In addition, neurological studies demonstrate a link between working memory and learning and attention.

Theories exist both regarding the theoretical structure of working memory and the role of specific parts of the brain involved in working memory. Research identifies the frontal cortex, parietal cortex, anterior cingulate, and parts of the basal ganglia as crucial. The neural basis of working memory has been derived from lesion experiments in animals and functional imaging upon humans.

Short-term memory (or "primary" or "active memory") is the capacity for holding a small amount of information in mind in an active, readily available state for a short period of time. The duration of short-term memory (when rehearsal or active maintenance is prevented) is believed to be in the order of seconds. A commonly cited capacity is 7±2 elements. In contrast, long-term memory can hold an indefinite amount of information. Short-term memory should be distinguished from working memory, which refers to structures and processes used for temporarily storing and manipulating information (see details below).

Dual-store memory model: According to Miller, whose paper in 1956 popularized the theory of the "magic number seven", short-term memory is limited to a certain number of chunks of information, while long-term memory has a limitless store.[1]

Atkinson-Shiffrin Memory Model: According to the dual store memory model proposed by Richard C. Atkinson and Richard Shiffrin in 1968, memories can reside in the short-term "buffer" for a limited time while they are simultaneously strengthening their associations in long-term memory. When items are first presented, they enter short-term memory, but due to its limited space, as new items enter, older ones are pushed out. However, each time an item in short term memory is rehearsed, it is strengthened in long term memory. Similarly, the longer an item stays in short-term memory, the stronger its association becomes in long-term memory.[2]

Baddeley's Model of Working Memory: In 1974 Baddeley and Hitch proposed an alternative theory of short term memory: Baddeley's model of working memory. According to this theory, short-term memory is divided into different slave systems for different types of input items, and there is an executive control supervising what items enter and exit those systems.[3][4] The slave systems include the phonological loop, the visuo-spatial sketchpad, and the episodic buffer (later added by Baddeley).[5]

Intermediate-term memory

Intermediate-term memory (ITM) is a stage of memory distinct from sensory memory, working memory/short-term memory, and long-term memory. While sensory memory persists for several milliseconds, working memory persists for up to thirty seconds, and long-term memory persists from thirty minutes to the end of an individual's life, intermediate-term memory persists for about two to three hours. This overlap in the durations of these memory processes indicates that they occur simultaneously, rather than sequentially. Indeed, intermediate-term facilitation can be produced in the absence of long-term facilitation. However, the boundaries between these forms of memory are not clear-cut, and they can vary depending on the task. Intermediate-term memory is thought to be supported by the parahippocampal cortex.

In 1993, Rosenzweig and colleagues demonstrated that, in rats conditioned to avoid an aversive stimulus, percent avoidance of the stimulus (and, by implication, memory of the aversive nature of the stimulus) reached relative minima at one minute, fifteen minutes, and sixty minutes. These dips were theorized to correspond to the time points in which the rats switched from working memory to intermediate-term memory, from intermediate-term memory to the early phase of long-term memory, and from the early phase of long-term memory to the late phase of long-term memory, respectively—thus demonstrating the presence of a form of memory that exists between working memory and long-term memory, which they referred to as "intermediate-term memory".

Though the idea of intermediate-term memory has existed since the 1990s, Sutton *et al.* introduced a novel theory for the neural correlates underlying intermediate-term memory in *Aplysia* in 2001, where they described it as the primary behavioral manifestation of intermediate-term facilitation.

Long-Term Memory

Long-term memory (**LTM**) is the final stage of the dual memory model proposed by Atkinson and Shiffrin, in which data can be stored for long periods of time. While short-term and working memory persists for only about 20 to 30 seconds, information can remain in long term memory indefinitely. According to Mazur (2006), long-term memory has also been called reference memory, because an individual must refer to the information in long-term memory when performing almost any task.

Long term memory is commonly broken down into explicit memory (declarative), which includes episodic memory, semantic memory, and autobiographical memory, and implicit memory (procedural memory).

Long-term memory encodes information semantically for storage, as researched by Baddeley.[6] In vision, the information needs to enter working memory before it can be stored into long-term memory. This is evidenced by the fact that the speed with which information is stored into long-term memory is determined by the amount of information that can be fit, at each step, into visual working memory.[7] In other words, the larger the capacity of working memory for certain stimuli, the faster will these materials be learned.

Synaptic Consolidation is the process by which items are transferred from short term to long term memory. Within the first minutes or hours after acquisition, the engram (memory trace) is encoded within synapses, becoming resistant (though not immune) to interference from outside sources.[8][9]

As long-term memory is subject to fading in the natural forgetting process, maintenance rehearsal (several recalls/retrievals of memory) may be needed to preserve long term memories.[10] Individual retrievals can take place in increasing intervals in accordance with the principle of spaced repetition. This can happen quite naturally through reflection or deliberate recall (also known as recapitulation), often dependent on the perceived importance of the material.

Sleep

Some theories consider sleep to be an important factor in establishing well-organized long-term memories. *(See also sleep and learning.)* Sleep plays a key function in the consolidation of new memories.[11]

According to Tarnow's theory, long-term memories are stored in dream format (reminiscent of the Penfield & Rasmussen's findings that electrical excitations of cortex give rise to experiences similar to dreams). During waking life an executive function interprets long-term memory consistent with reality checking (Tarnow 2003). Also, that the information stored in memory, no matter how it was learned, can affect performance on a particular task without the subject being aware that this memory is being used. Newly acquired declarative memory traces are believed to be reactivated during NonREM sleep to promote their hippocampo-neocortical transfer for long-term storage.[12] Specifically new declarative memories are better remembered if recall follows Stage II non-rapid eye movement sleep. The reactivation of memories during sleep can lead to lasting synaptic changes within certain neural networks. It is the high spindle activity, low oscillation activity, and delta wave activity during NREM sleep that helps to contribute to declarative memory consolidation. In learning before sleep spindles are redistributed to neuronally active upstates within slow oscillations.[11] Sleep spindles are thought to induce synaptic changes and thereby contribute to memory consolidation during sleep. Here, we examined the role of sleep in the object-place recognition task, a task closely comparable to tasks typically applied for testing human declarative memory: It is a one-trial task, hippocampus-dependent, not stressful and can be repeated within the same animal.[13] Sleep deprivation reduces vigilance or arousal levels, affecting the efficiency of certain cognitive functions such as learning and memory.[14]

The theory that sleep benefits memory retention is not a new idea. It has been around since Ebbinghaus's experiment on forgetting in 1885. More recently studies have been done by Payne and colleagues and Holtz and colleagues.[15] In Payne and colleague's[16] experiment participants were randomly selected and split into two groups. Both groups were given semantically related

or unrelated word pairs, but one group was given the information at 9am and the other group received theirs at 9pm. Participants were then tested on the word pairs at one of three intervals 30 minutes, 12 hours, or 24 hours later. It was found that participants who had a period of sleep between the learning and testing sessions did better on the memory tests. This information is similar to other results found by previous experiments by Jenkins and Dallenbach (1924). It has also been found that many domains of declarative memory are affected by sleep such as emotional memory, semantic memory, and direct encoding.[16]

Holtz[15] found that not only does sleep affect consolidation of declarative memories, but also procedural memories. In this experiment fifty adolescent participants were taught either word pairs (which represents declarative memory) and a finger taping task(procedural memory at one of two different times of day. What they found was that the procedural finger taping task was best encoded and remembered directly before sleep, but the declarative word pairs task was better remembered and encoded if learned at 3 in the afternoon.[15]

Divisions of Long Term Memory

The brain does not store memories in one unified structure, as might be seen in a computer's hard disk drive. Instead, different types of memory are stored in different regions of the brain. Long term memory is typically divided up into two major headings: explicit memory and implicit memory.[2]

Explicit memory (declarative memory) refers to all memories that are consciously available. These are encoded by the hippocampus, entorhinal cortex, and perirhinal cortex, but consolidated and stored elsewhere. The precise location of storage is unknown, but the temporal cortex has been proposed as a likely candidate. Research by Meulemans and Van der Linden (2003) found that amnesiac patients with damage to the medial temporal lobe performed more poorly on explicit learning tests than did healthy controls. However, these same amnesiac patients performed at the same rate as healthy controls on implicit learning tests. This implies that the medial temporal lobe is heavily involved in explicit learning, but not in implicit learning.[17][18]
Declarative memory has three major subdivisions:

Episodic memory refers to memory for specific events in time, as well as supporting their formation and retrieval. Some examples of episodic memory would be remembering someone's name and what happened at your last interaction with each other.[19][20] Experiments conducted by Spaniol and colleagues indicated that older adults have worse episodic memories than younger adults because episodic memory requires context dependent memory.[21]

Semantic memory refers to knowledge about factual information, such as the meaning of words. Semantic memory is independent information such as information remembered for a test.[20] In contrast with episodic memory older adults and younger adults do not show much of a difference with semantic memory, presumably because semantic memory does not depend on context memory.[21]

Autobiographical memory refers to knowledge about events and personal experiences from an individual's own life. Though similar to episodic memory, it differs in that it contains only those experience which directly pertain to the individual, from across his lifespan. Conway and Pleydell-Pearce (2000) argue that this is one component of the self-memory system.[22]

Implicit memory (procedural memory) refers to the use of objects or movements of the body, such as how exactly to use a pencil, drive a car, or ride a bicycle. This type of memory is encoded and it is presumed stored by the striatum and other parts of the basal ganglia. The basal ganglia is believed to mediate procedural memory and other brain structures and is largely

independent of the hippocampus.[23] Research by Manelis, Hanson, and Hanson (2011) found that the reactivation of the parietal and occipital regions was associated with implicit memory.[24] Procedural memory is considered non-declarative memory or unconscious memory which includes priming and non-associative learning.[20][25]

Other categories of memory may also be relevant to the discussion of long term memory. For example:

Emotional memory, the memory for events that evoke a particularly strong emotion, is a domain that can involve both declarative and procedural memory processes. Emotional memories are consciously available, but elicit a powerful, unconscious physiological reaction. Research indicates that the amygdala is extremely active during emotional situations, and acts with the hippocampus and prefrontal cortex in the encoding and consolidation of emotional events.[26][27]

Working memory is not part of long term memory, but is important for long term memory to function. Working memory holds and manipulates information for a short period of time, before it is either forgotten or encoded into long term memory. Then, in order to remember something from long term memory, it must be brought back into working memory. If working memory is overloaded it can affect the encoding of long term memory. If one has a good working memory they may have a better long term memory encoding.[28][29]

Footnotes

6. Baddeley, A. D. (1966). The influence of acoustic and semantic similarity on long-term memory for word sequences. The Quarterly Journal of Experimental Psychology, 18, 302–309.
7. Nikolić, D. and Singer, W. (2007) Creation of visual long-term memory. Perception & Psychophysics, 69: 904–912.
8. Dudai, Yadin (2003). "The neurobiology of consolidations, or, how stable is the engram?" *Annual Review of Psychology*, 55, 51-86.
9. Dudai, Yadin (2002). Memory from A to Z: Keywords, concepts, and beyond. Oxford, UK: Oxford University Press.
10. Greene, R. L. (1987) Effects of maintenance rehearsal on human memory. *Psychological Bulletin*, 102(3), 403-413.
11. Ruch, S., Markes, O., Duss, B. S., Oppliger, D. Reber, P. T., Koenig, T., Mathis, J., Roth, C., Henke, K. (2012). Sleep stage II contributes to the consolidation of declarative memories. *Neuropsychologia*, 50(2012), 2389–2396
12. Bergmann, T. O.; Molle, M.; Diedrichs, J.; Born, J.; Siebner, H. R. (1 February 2012). "Newly acquired declarative memory traces are believed to be reactivated during NonREM sleep to promote their hippocampo-neocortical transfer for long-term storage.". *NeuroImage* **59** (3): 2733–2742.
13. Binder, S.; Baier, P.; Mölle, M.; Inostroza, M.; Born, J; Marshall, L. (February 2012). "Sleep enhances memory consolidation in the hippocampus-dependent object-place recognition task in rats.". *Neurobiology of Learning and Memory* **2** (97): 213–219.
14. Martella, D.; Plaza, V.; Estévez, A. F.; Castillo, A.; Fuentes, L. J. (2012). "Minimizing sleep deprivation effects in healthy adults by differential outcomes". *Acta Psychologica* **139** (2): 391–396.
15. Holz, J., Piosczyk, H., Landnann, N., Feige, B., Spiegelhalden, K., Riemann, D., Nissen, C., Voderholzer, V. (2012). "The timing of learning before night-time sleep differentiall affects declarative and procedural long-term memory consolidation in adolescents" *PLoS ONE*, 7(7), 1–10.
16. Payne, D. J., Tucker, A. M., Ellenbogen, M. J., Wamsley, J. E., Walker, P. M., Schacter, L. D., Stickglod, R. (2012). "Memory for semantically related and unrelated declarative information: the benefit of sleep, the cost of wake" *PLoS One*, 7(3), 1–8.
17. Meulemans, Thierry & Van der Linden, Martial (2003). Implicit learning of complex information in amnesia. *Brain and Cognition*, 52(2), 250-257.
18. Aggleton, John P. (2008). Understanding anterograde amnesia: Disconnections and hidden lesions. The Quarterly Journal of Experimental Psychology, 61(10), 1441-1471.
19. Ranganath, C. C., Michael, B.X., Craig, J.B. (2005). Working Memory Maintenance Contributes to Long-term Memory Formation: Neural and Behavioral Evidence. *Journal of Cognitive Neuroscience*, 17(7), 994–1010.

20. Wood,R.,Baxer,P.,Belpaeme,T. (2011). A review of long term memory in natural and synthetic systems. *Adaptive Behavior*, 20(2), 81–103.
21. Spaniol, J., Madden, D. J., Voss, A. (2006). A Diffusion Model Analysis of Adult Age Differences in Episodic and Semantic Long–Term Memory Retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 32(1), 101–117,
22. Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review*, 107(2), 261-288.
23. Foerde, K., & Poldrack, R.A. (2009). Procedural learning in humans. The New Encyclopedia of Neuroscience, 7, 1083-1091.
24. Manelis, A., Hanson, C., & Hanson, S. J. (2011). Implicit memory for object locations depends on reactivation of encoding-related brain regions. *Human Brain Mapping*, 32(1), 32-50.
25. Holz, J., Piosczyk, H., Landnann, N., Feige, B., Spiegelhalden, K., Riemann, D., Nissen, C., Voderholzer, V. (2012). *PLoS ONE*, 7(7), 1–10
26. Buchanan, Tony W. (2007). Retrieval of emotional memories. *Psychological Bulletin*, 133(5).
27. Cahill, L. & McGaugh, J. L. (1996). Modulation of memory storage. Current Opinion and Neurobiology, 6(2), 237-242.
28. Ranganath, C. C., Michael, B.X., Craig, J.B. (2005) Working Memory Maintenance Contributes to Long-term Memory Formation: Neural and Behavioral Evidence. *Journal of Cognitive Neuroscience*, 17(7), 994–1010
29. Axmacher, N., Haupt, S., Cohen, M. X., Elger, C. F., Fell, J. (2010). Electrophysiological signature of working and long-term memory interaction in the human hippocampus. *European Journal of Neuroscience*, 31(1), 101–117.

TOPIC: Memory Development

The following text borrows extensively from Wikipedia, which offers a helpful synopsis of ***memory development***.

The development of memory in children becomes evident within the first 2 to 3 years of a child's life as they show considerable advances in declarative memory. This enhancement continues into adolescence with major developments in short term memory, working memory, long term memory and autobiographical memory.[1]

Recent research on the development of memory has indicated that declarative, or explicit memory, may exist in infants who are even younger than two years old. For example, newborns who are less than 3 days old demonstrate a clear preference for their mother's own voice.[2]

Cognitive Neuroscience of Memory Development

Declarative memory develops very rapidly throughout the first 2 years of life; infants of this age show evidence of cognitive development in many ways (e.g., increased attention, language acquisition, increasing knowledge). There is a difference in the brain development of explicit and implicit memory in infants. Implicit memory is controlled by an early-developing memory system in the brain that is present very early on, and can be explained by the early maturation of striatum, cerebellum, and brain stem, which are all involved in implicit learning and memory.[3] Development of explicit memory depends on a later developing memory system in the brain that reaches maturity between 8 and 10 months of age. Explicit memory depends heavily on structures in the medial temporal lobe, including the hippocampus and the parahippocampal cortex. Much of the brain system is formed before birth, however the dentate gyrus within the hippocampal formation has about 70% of the number of cells in adults.[4]

Rapid myelination of axons within the central nervous system occurs during first year of life which can dramatically increase the efficiency and speed of transmission in neurons. This can explain the higher processing speed of older infants as compared to younger ones.[5]

Working Memory

According to Baddeley's model of working memory, working memory is composed of three parts. First is the central executive which is responsible for a range of regulatory functions including attention, the control of action, and problem solving. Second, the phonological loop, which is specialized for the manipulation and retention of material in particular informational domains. Finally, the visuospatial sketchpad stores material in terms of its visual or spatial features. The strength of the relationships between the three components of working memory vary; the central executive is strongly linked with both the phonological loop as well as the visuospatial sketchpad which are both independent of each other. Evidence indicates linear increases in performance of working memory from age 4 years through to adolescence.[6]

Central Executive

In children under the age of 4, the memory storage capacity limitation constrains complex comprehension processes. As the child grows older however, less processing is necessary which opens more storage space for memory.[7]

Phonological Loop

Evidence indicates linear increases in performance from age 4 years through to adolescence. Prior to about 7 years of age, serial recall performance is mediated by the phonological store which is one component of the phonological loop. Preschool aged children do not use a subvocal rehearsal strategy to maintain decaying phonological representations in the store but instead they identify visual features of pictures in order to remember them. This is evident first by watching

children for overt sign of rehearsal (for example lip movement) and second if the child is given nameable pictures, there are no differences in retrieval found for long versus short words. At the age of seven, children begin to use a subvocal rehearsal process to maximize retention in the phonological store. As development continues, nonauditory memory material is recoded into a phonological code suitable for the phonological loop when possible.[7]

Visuospatial Sketchpad

Younger children (under the age of 5) are more dependent than older children or adults on using the visuospatial sketchpad to support immediate memory for visual material. Older children adopt a strategy of verbally recoding pictures where possible and also use the phonological loop to mediate performance of the "visual" memory task. Between the ages of 5 and 11, visual memory span increases substantially and it is at this point when adult levels of performance are reached.[7]

Long Term Memory

Explicit memory becomes much better over the developmental years. However, there are small effects of age on implicit memory, which could be because implicit memory involves more basic processes than declarative memory which would make it less affected by a child's developing cognitive skills and abilities.

Pre-school Children

Infants at as early as 7-months-old can conceptually differentiate between categories such as animals and vehicles. Although infants' concepts may be crude by adult standards, they still allow infants to make meaningful semantic distinctions. An example is that infants can differentiate between items belonging to a kitchen and those items belonging to a bathroom.[8] At the very least, these categories lay a foundation for early knowledge development, organizing information in storage and influence future encoding. Infants from 16 months old are able to draw on their semantic knowledge in generalization and inference. This knowledge can also be used by older toddlers, 24-month-olds, to facilitate acquisition and retention of new information. Their knowledge of causal ordering of events can be used to help to recall the sequence of events.

Knowledge itself will not alter retention performance, rather how well that knowledge is structured will alter performance. Better retention was shown with information that had greater cohesion and more elaborative elements. Familiarity and repetition of an experience can also influence the organization of information in storage for preschoolers and older children.[9] Children who experienced an event twice recalled the event better 3 months later than did children who only experienced it once and showed equally good recall at 3 months compared to recall at 2 weeks after experiences.

School Age Children

Age differences in memory are attributed to age-correlated growth in the foundation of knowledge. What children know affects what they encode, how that information is organized in storage, and the manner in which it's retrieved. The greater the background knowledge about the to-be-encoded information, the better that the information is remembered.[9] Because older children have more knowledge than younger children, older children perform better than younger children in most memory tasks. When familiarity and meaningfulness of material were equated across age, developmental differences in memory performance was no longer a factor.

Children's use of memory strategies and the development of metamemory skills are also instrumental in age-related changes in memory, particularly later in childhood years.[10] Knowledge influences memory by affecting retrieval, by facilitating spread of activation among related items in memory and by facilitating the use of strategies. Knowledge also provides better elaboration of information which can strengthen its storage in memory.

Episodic Memory
By school age, the typical child shows skill in recalling details of past experiences and in organizing those details into a narrative form with cohesion. Memories formed at this age and beyond are more likely to stand the test of time over the years and be recalled in adulthood, compared to earlier memories. Young children can sometimes retain information from specific episodes over very long periods of time, but the particular information a child of a particular age is likely to retain over different periods of time is unpredictable. This depends on the nature of the memory event and individual differences in the child such as gender, parental style of communication, and language ability.[9]

Autobiographical Memory
The amount of information that is able to be recalled depends on the child's age at the time of the event. Children at the age of 1-2 can recall personal events, though only in fragments when questioned several months later. Two-year-old children form autobiographical memories and remember them over periods of at least several months.[9]

Difficulty in assessing memory in young children can be attributed to their level of language skills; this is because memory tests usually occur in the form of a verbal report. It is unclear whether performance on memory assessments is due to poor memory for the event or to the inability to express what they remember in words. However, memory tests assessing performance with a nonverbal photograph recognition test and behavioral re-enactment showed that children had signs of recall from 27 months, as opposed to 33 months, where children showed only reasonable verbal recall.[11]

Childhood Amnesia
Infantile amnesia is the tendency to have few autobiographical memories from below the age of 5. Although autobiographical memories start forming between the ages of 2 and 3 and can be remembered for several months, they are nearly always forgotten by adulthood. This can be attributed to lack of memory rehearsal; young children do not engage in rehearsal of remembered information. There are two theoretical explanations for why this may occur; although they take different approaches, they are not mutually exclusive of each other.

Cognitive Self
Autobiographical memories can only begin to form after infants have developed a sense of self to whom events having personal significance can occur.[12] Evidence of a sense of self develops towards the end of the second year of life, in between 21 and 24 months of age. The development of a cognitive self provides a new framework from which memories can be organized. With this cognitive advancement, we see the emergence of autobiographical memory and the end of infantile amnesia.[13]

Social Cultural Influences
Language and culture play central roles in the early development of autobiographical memory. The manner in which parents discuss the past with their children and how elaborative they are in reminiscing has an impact on how the child encodes the memory. Children whose parents talk in detail about the past are being provided with good opportunities to rehearse their memories. The parents' use of language at the time in which the event occurred can also play a factor in how the

child remembers the episode. Cultural differences in parenting styles and parent-child relationships can contribute to autobiographical memory at an early age.[14]

Memory Strategies
Memory strategies are ways in which individuals can organize the information that they are processing in order to enhance recall in the future. Memory strategies that are helpful may include but are not limited to verbal rehearsal or mnemonics. The use of memory strategies varies in both the types of strategies used as well as the effectiveness of the strategies used across different age groups.[15]

Metamemory
As children grow older, they show increasing evidence of metamemory which is the knowledge about their memory and how it works.[1] There is strong evidence that suggests that greater awareness and knowledge about ones memory leads to increased use of memory strategies and greater levels of recall.[16]

In children under 7, the relationship between metamemory, strategy use, and recall is very weak or absent. This can be seen when comparing older children (over the age of 7) and preschool children on sorting tasks where children are asked to sort objects into groups that go together (for example animals)and attempt to recall them.[17]

Preschool Children
Preschool children use simple tactics for remembering but do not use mental strategies and do not typically differentiate memory and perception. In order to remember objects, they tend to verbally name or visually inspect items and use memory strategies intermittently or inconsistently even if they are aware of how they can improve recall.[18] Memory Strategies are used more consistently by children if they are reminded and taught to use them each time they are processing something that should be remembered.[19]

By age 7
By the age of 7, the awareness of the benefits of memory strategies in learning arises. The goal is for children to recognize the advantage of using memory strategies such as categorizing rather than simply looking or naming.[20] At this age, children spontaneously use rehearsal to enhance short-term memory performance and retrieval strategies begin to be used spontaneously without the guidance of others.[19]

Late Elementary School
In late elementary school, children engage in self-directed use of organization and demonstrate the ability to impose a semantic structure on the to-be-remembered items to guide memory performance. For example, if a child is packing their bag for school they can go through each part of their day and think of each item that they need to pack.[19] Children at this age understand the advantages of using memory strategies and make use of strategies like categorization over looking or naming if they are instructed to think about learning strategies prior to learning.[20]

Early Adolescence
In early adolescence, children begin to use elaborative rehearsal meaning that items are not simply kept in mind but rather are processed more deeply. They also prefer to use memory strategies such as categorization rather than simple rehearsal, looking or naming and use these strategies without needing to think about memory strategies prior to learning.[20]

References

1. Siegler, R. S. (1998). *Children's Thinking* (3rd ed.). Upper Saddle River, NJ: Prentice Hall.
2. DeCasper, A.J., & Fifer, W.P. (1980). Of human bonding: Newborns prefer their mothers' voices. Science, 208, 1174-1176
3. Schacter, D., & Moscovitch, M. (1984). Infants, amnesiacs, and dissociable memory. In M. Moscovitch (Ed.), Infant Memory (pp 173-209). New York: Plenum.
4. Richmond, J., & Nelson, C.A. (2007). Accounting for change in declarative memory: A cognitive neuroscience perspective. Developmental Review, 27, 349-373
5. Webb, S., Long, J., & Nelson, C. (2005). A longitudinal investigation of visual event-related potentials in the first year of life. Developmental Science, 8, 605-616.
6. Baddeley, A. D., & Hitch, G. (1974). Working memory. In G. Bower (Ed.), The psychology of learning and motivation (Vol. 8, pp. 47–90). New York: Academic Press.
7. Gathercole, S. (2003) The development of memory. Journal of Child Psychology and Psychiatry, vol. 39, No.1, 3-27
8. Mandler, Fivush & Reznick, 1987
9. Fivush, R., Gray, J. T., & Fromhoff, F.A. (1987). Two-year-olds talk about the past. Cognitive Development, 2, 393-409
10. O'Sullivan & Howe, 1998
11. Simcock, G; H. Hayne (2003). "Age-related changes in verbal and non-verbal memory during early childhood". *Developmental Psychology*: 805–814.
12. Howe, M.L.,& Courage, M.L. (1997). The emergence and development of autobiographical memory. Psychological Review, 104, 499-523
13. Lewis, M., & Brooks-Gunn, J. (1979). Toward a theory of social cognition: The development of self. New Directions for Child Development, 4, 1-20.
14. Fivush and Nelson 2004 Fivush, R., & Nelson, K. (2004). Culture and language in the emergence of autobiographical memory. Psychological Science, 15, 291-297.
15. Miller, P.H.(1994). Individual Differences in Children's Strategic Behaviors: Utilization Deficiencies. *Learning and Individual Differences, 6*(3),285-307.
16. Henry,L.A & Norman, T.(1996)The Relationships between Memory Performance, Use of Simple Memory Strategies and Metamemory in Young Children. *International Journal of Behavioral Development, 1996*(1), 177-199.
17. Schneider,W.(1985). Developmental Trends in the Metamemory-memory behavior Relationship: An Integrated Review.*Metacognition, cognition and human performance*,1,57-109.
18. Henry,L.A & Norman, T.(1996)The Relationships between Memory Performance, Use of Simple Memory Strategies and Metamemory in Young Children. *International Journal of Behavioural Development, 1996*(1), 177-199.
19. McVey, K.A., Newman, R.S., & Paris, S.G.(1982)Learning the Functional Significance of Mnemonic Actions: A Microgenic Study of Strategy Acquisition.*Journal of Experimental Child Psychology,34* 490-509.
20. Justice, M.E. (1985). "Categorization as a Preferred Memory Strategy: Developmental Changes During Elementary School". *Developmental Psychology* **21**: 1105–1110.

TOPIC: Schema / Script Memory

The following text borrows extensively from Wikipedia, which offers a readable synopsis of ***schema***.

In psychology and cognitive science, a **schema** (plural *schemata* or *schemas*) describes an organized pattern of thought or behavior that organizes categories of information and the relationships among them. It can also be described as a mental structure of preconceived ideas, a framework representing some aspect of the world, or a system of organizing and perceiving new information. Schemata influence attention and the absorption of new knowledge: people are more likely to notice things that fit into their schema, while re-interpreting contradictions to the schema as exceptions or distorting them to fit. Schemata have a tendency to remain unchanged, even in the face of contradictory information. Schemata can help in understanding the world and the rapidly changing environment. People can organize new perceptions into schemata quickly as most situations do not require complex thought when using schema, since automatic thought is all that is required.

People use schemata to organize current knowledge and provide a framework for future understanding. Examples of schemata include academic rubrics, social schemas, stereotypes, social roles, scripts, worldviews, and archetypes. In Piaget's theory of development, children adopt a series of schemata to understand the world.

Some general principles from script memory research include:

- Primary Rule: The first in a series of events is remembered best.
- Recency rule. The last in a series of events is also remembered best.

History

Before psychology separated from philosophy, the term "schema" was prominently discussed in philosophy by Immanuel Kant.[4] Early developments of the idea in psychology emerged with the gestalt psychologists and Jean Piaget: the term "schema" was introduced by Piaget in 1926.[5] The concept was introduced into psychology and education through the work of the British psychologist Frederic Bartlett,[6] who drew on the term body schema used by neurologist Henry Head. It was expanded into schema theory by educational psychologist R. C. Anderson.[5] Since then, many other terms have been used to describe schema, such as including "frame", "scene", and "script".

Schematic processing

Through the use of schemata, a heuristic technique to encode and retrieve memories, the majority of typical situations do not require much strenuous processing. People can quickly organize new perceptions into schemata and act without effort.[7]

However, schemata can influence and hamper the uptake of new information (proactive interference), such as when existing stereotypes, giving rise to limited or biased discourses and expectations (prejudices), may lead an individual to "see" or "remember" something that has not happened because it is more believable in terms of his/her schema.[8] For example, if a well-dressed businessman draws a knife on a vagrant, the schemata of onlookers may (and often do) lead them to "remember" the vagrant pulling the knife. Such distortion of memory has been demonstrated. (See Background research below.)

Schemata are interrelated and multiple conflicting schemata can be applied to the same information. Schemata are generally thought to have a level of activation, which can spread

among related schemata. Which schema is selected can depend on factors such as current activation, accessibility, and priming.

Accessibility is how easily a schema comes to mind, and is determined by personal experience and expertise. This can be used as a cognitive shortcut; it allows the most common explanation to be chosen for new information.
With priming, a brief imperceptible stimulus temporarily provides enough activation to a schema so that it is used for subsequent ambiguous information. Although this may suggest the possibility of subliminal messages, the effect of priming is so fleeting that it is difficult to detect outside laboratory conditions. Furthermore, the mere exposure effect —which requires consciousness of the stimuli— is far more effective than priming.

Background research

The original concept of schemata is linked with that of reconstructive memory as proposed and demonstrated in a series of experiments by Bartlett.[9] By presenting participants with information that was unfamiliar to their cultural backgrounds and expectations and then monitoring how they recalled these different items of information (stories, etc.), Bartlett was able to establish that individuals' existing schemata and stereotypes influence not only how they interpret "schema-foreign" new information but also how they recall the information over time. One of his most famous investigations involved asking participants to read a Native American folk tale, "The War of the Ghosts", and recall it several times up to a year later. All the participants transformed the details of the story in such a way that it reflected their cultural norms and expectations, i.e. in line with their schemata. The factors that influenced their recall were:

- Omission of information that was considered irrelevant to a participant;
- Transformation of some of the details, or of the order in which events, etc., were recalled; a shift of focus and emphasis in terms of what was considered the most important aspects of the tale;
- Rationalization: details and aspects of the tale that would not make sense would be "padded out" and explained in an attempt to render them comprehensible to the individual in question;
- Cultural shifts: the content and the style of the story were altered in order to appear more coherent and appropriate in terms of the cultural background of the participant.

Bartlett's work was crucially important in demonstrating that long-term memories are neither fixed nor immutable but are constantly being adjusted as our schemata evolve with experience. In a sense it supports the existentialist view that we construct our past and present in a constant process of narrative/discursive adjustment, and that much of what we "remember" is actually confabulated (adjusted and rationalized) narrative that allows us to think of our past as a continuous and coherent string of events, even though it is probable that large sections of our memory (both episodic and semantic) are irretrievable to our conscious memory at any given time.[9]

An important step in the development of schema theory was taken by the work of D.E. Rumelhart describing our understanding of narrative and stories.[10] See also J. M. Mandler[11] Further work on the concept of schemata was conducted by Brewer and Treyens (1981)[12] who demonstrated that the schema-driven expectation of the presence of an object was sometimes sufficient to trigger its erroneous recollection. An experiment was conducted where participants were requested to wait in a room identified as an academic's study and were later asked about the room's contents. A number of the participants recalled having seen books in the study whereas

none were present. Brewer and Treyens concluded that the participants' expectations that books are present in academics' studies were enough to prevent their accurate recollection of the scenes.

In the 1970s, computer scientist Marvin Minsky was trying to develop machines that would have human-like abilities. When he was trying to create solutions for some of the difficulties he encountered he came across Bartlett's work and decided that if he was ever going to get machines to act like humans he needed them to use their stored knowledge to carry out processes. To compensate for that he created what was known as the frame construct, which was a way to represent knowledge in machines. His frame construct can be seen as an extension and elaboration of the schema construct. He created the frame knowledge concept as a way to interact with new information. He proposed that fixed and broad information would be represented as the frame, but it would also be composed of slots that would accept a range of values; but if the world didn't have a value for a slot, then it would be filled by a default value.[13] Because of Minsky's work, computers now have a stronger impact on psychology. In the 80's, David Rumelhart extend Minsky's ideas, creating an explicitly psychological theory of the mental representation of complex knowledge.[14]

Roger Schank and Robert Abelson were the ones to come up with the idea of a script, which was known as a generic knowledge of sequences of actions. This led to many new empirical studies, which found that providing relevant schema can help improve comprehension and recall on passages.[15]

Modification

New information that falls within an individual's schema is easily remembered and incorporated into their worldview. However, when new information is perceived that does not fit a schema, many things can happen. The most common reaction is to simply ignore or quickly forget the new information.[16] This can happen on a deep level— frequently an individual does not become conscious of or even perceive the new information. People may also interpret the new information in a way that minimizes how much they must change their schemata. For example, Bob thinks that chickens don't lay eggs. He then sees a chicken laying an egg. Instead of changing the part of his schema that says 'chickens don't lay eggs', he is likely to adopt the belief that the animal in question that he has just seen laying an egg is not a real chicken. This is an example of 'disconfirmation bias', the tendency to set higher standards for evidence that contradicts one's expectations.[17] However, when the new information cannot be ignored, existing schemata must be changed or new schemata must be created (accommodation). [18]

Jean Piaget (1896-1980) was known best for his work with development of human knowledge. He believed knowledge was constructed on cognitive structures and he believed we developed our own cognitive structures through schema by accommodating and assimilating information. Accommodation is creating new schema that will fit better with the new environment or adjusting old schema. You should think of accommodation as change. Accommodation could also be interpreted as putting restrictions on schema you have already had. Accommodation usually comes about when assimilation has failed. Assimilation is when you use current schema to understand the world around you. Piaget thought that schema would be applied to everyday life and therefore you would accommodate and assimilate information naturally.[19] For example, if this chicken has red feathers, Bob can form a new schemata that says 'chickens with red feathers can lay eggs'. This schemata will then be either changed or removed, in the future.

Assimilation is the reuse of schemata to fit the new information. An example would be, when an unfamiliar dog is seen, a person will probably just integrate it into their dog schema. However, if the dog behaves strangely, and in ways that doesn't seem dog-like, there will be accommodation

as a new schema is formed for that particular dog. With Accommodation and Assimilation comes the idea of equilibrium. Piaget describes equilibrium as a state of cognition that is balanced. When schema are capable of explaining what it sees and perceives. It moves development along in children and adults, Piaget did not think that development progressed steadily but actually in leaps and bounds. When information is new and cannot fit into existing schema this is called disequilibrium and this is an unpleasant state for the child's development. When disequilibrium happens, it means we are frustrated and we will try to restore the balance in our cognitive development by trying to overcome the new information through accommodation. If the new information is taken then assimilation of the new information will proceed until they find that they must make a new adjustment to it later down the road, but for now the child remains at equilibrium again. The process of Equilibration is when you move from the equilibrium phase to the disequilibrium phase and back into equilibrium.[20]

There are different kinds of schema that someone can experience. The first and most obvious one is self-schema; this schema contains information that we think about ourselves. It can sometimes influence, modify or distort what we remember or how we recall information. The next schema is person schema, which is the idea that we all have schema that includes judgments and traits that everyone possesses. Role schema is when we have ideas based on the jobs that other people have and social positions in the world. Event schema is what we associate with activities and events that other people perform.

There are advantages and disadvantages to having schema affect our lives; some of the advantages about having schema in our cognitive development is that we now contain some information about how other people behave and think too. We now know what is an appropriate way to respond to certain situations because we formed a schema about what the procedure is. We have a reference for behavior in certain situations based on our event schema, also it helps us explain why certain people have behaviors that are social due to our role schema.

With advantages come disadvantages; when we form schema it may restrict and distort the way we view things or remember things about information and at times may make us overlook some things we should have paid attention to. Schema is hard to change because we are attracted to information that supports our schema rather than disproves it and is inconsistent. This may pose a problem for people because it is hard to change someone's mind about an idea they have already based a large schema about.[21]

Self-schemata

Schemata about oneself are considered to be grounded in the present and based on past experiences. Memories, as mentioned, are framed in the light of one's self-conception. For example, people who have positive self-schemata (i.e. most people) selectively attend to flattering information and selectively ignore unflattering information, with the consequence that flattering information is subject to deeper encoding, and therefore superior recall.[22] Even when encoding is equally strong for positive and negative feedback, positive feedback is more likely to be recalled.[23] Moreover, memories may even be distorted to become more favorable - people typically remember exam grades as having been better than they actually were.[24] However, when people have negative self views, memories are generally biased in ways that validate the negative self-schema; People with low self-esteem, for instance, are prone to remember more negative information about themselves than positive information.[25] Thus, memory tends to be biased in a way that validates the agent's pre-existing self-schema.

There are three major implications of self-schemata. First, information about oneself is processed faster and more efficiently, especially consistent information. Second, one retrieves and

remembers information that is relevant to one's self-schema. Third, one will tend to resist information in the environment that is contradictory to one's self-schema. For instance, students with a particular self-schema prefer roommates whose view of them is consistent with that schema. Students who end up with roommates whose view of them is inconsistent with their self-schema are more likely to try to find a new roommate, even if this view is positive.[26] This is an example of self-verification.

As researched by Aaron Beck, automatically-activated negative self-schemata are a large contributor to depression. According to Cox, Abramson, Devine, and Hollon (2012), these self-schemata are essentially the same type of cognitive structure as stereotypes studied by prejudice researchers (e.g., they are both well-rehearsed, automatically activated, difficult to change, influential toward behavior, emotions, and judgments, and bias information processing).[27]

Self-Schema can also be self-perpetuating, it sometimes can represent a particular role in society that is based on stereo-type for example "If a mother tells her daughter she looks like a tom boy, her daughter may react by choosing activities that she imagines a tom boy would do. Conversely, if the mother tells her she looks like a princess, her daughter might choose activities thought to be more feminine." This is an example of the self-schema becoming self-perpetuating when the person at hand chooses an activity that was based on an expectation rather than their desires.[28]

References

1. DiMaggio, P. (1997). Culture and cognition. Annual Review Of Sociology, 23263-287. doi:10.1146/annurev.soc.23.1.263
2. "Glossary". Retrieved 7 March 2013.
3. Nadkarni, S., & Narayanan, V. K. (2007). Strategic schemas, strategic flexibility, and firm performance: The moderating role of industry Cclockspeed. *Strategic Management Journal*, 28(3), 243-270. doi:10.1002/smj.576
4. Nevid, J. S. (2007). Kant, cognitive psychotherapy, and the hardening of the categories. Psychology and Psychotherapy: Theory, Research and Practice, 80(4), 605-615. doi:10.1348/147608307X204189
5. "Schema theory of learning". *LinguaLinks Library*. SIL International. 2 July 1998.
6. Bartlett, F.C. (1932). *Remembering: A Study in Experimental and Social Psychology*. Cambridge, England: Cambridge University Press.
7. Kleider, H. M., Pezdek, K., Goldinger, S. D., & Kirk, A. (2008). Schema-driven source misattribution errors: Remembering the expected from a witnessed event. Applied Cognitive Psychology, 22(1), 1-20. doi:10.1002/acp.1361
8. Tuckey, M., & Brewer, N. (2003). The influence of schemas, stimulus ambiguity, and interview schedule on eyewitness memory over time. Journal Of Experimental Psychology: Applied, 9(2), 101-118. doi:10.1037/1076-898X.9.2.101
9. Bartlett, F.C. (1932). Remembering: A study in experimental and social psychology. Cambridge, England: Cambridge University Press
10. Rumelhart,D.E.(1980) Schemata: the building blocks of cognition. In: R.J. Spiro et al.(Eds) Theoretical Issues in Reading Comprehension, Hillsdale, NJ: Lawrence Erlbaum.
11. Mandler, J. M. (1984). Stories, scripts, and scenes: Aspects of schema theory. Hillsdale, NJ: Lawrence Erlbaum Associates.
12. Brewer, W. F., & Treyens, J. C. (1981). Role of schemata in memory for places. Cognitive Psychology, 13, pp207–230, W. F.; Treyens, J. C. (1981). "Role of schemata in memory for places". *Cognitive Psychology* **13**: 207–230.
13. Minsky, Marvin (1975). Patrick H. Winston, ed. *A Framework for Representing Knowledge* (The Psychology of Computer Vision ed.). New York: McGraw-Hill.
14. Rumelhart, David E. (1980). *Schemata: The Building Blocks of Cognition* (Theoretical Issues in Reading Comprehension ed.). Hillsdale, NJ: Erlbaum.
15. Schank, Rodger C.; Abelson, Robert P. (1977). *Scripts, Plans, Goals and Understanding*. Hillsdale, NJ: Erlbaum.
16. Taylor, S. E., & Crocker, J. (1981). Schematic bases of social information processing. In E. T. Higgins, C. A. Herman, & M. P. Zanna (Eds.), Social cognition: The Ontario Symposium on Personality and Social Psycholgoy (pp. 89-134). Hillsdale, NJ: Erlbaum.

17. Taber, Charles S.; Lodge, Milton (2006). "Motivated Skepticism in the Evaluation of Political Beliefs". *American Journal of Political Science* (Midwest Political Science Association) **50** (3): 755–769.
18. O'Sullivan, Chris S., & Francis T. Durso (1984) Effect of schema-incongruent information on memory for stereotypical attributes. Journal of Personality and Social Psychology 47(1): 55-70.
19. Piaget, Jean (2001). Robert L. Campbell, ed. *Studies in Reflection Abstraction*. Sussex: Psychology Press.
20. McLeod, S. A (2009). "Jean Piaget | Cognitive Theory". Retrieved 25 February 2013.
21. Gates, Robert C. "Social Psychology". Retrieved 25 February 2013.
22. Sedikides, C., & Green J. D. (2000). On the self-protective nature of inconsistency/negativity management: Using the person memory paradigm to examine self-referent memory. Journal of Personality and Social Psychology, 79, 906-92.
23. Sanitioso, R., Kunda, Z., & Fong, G. T. (1990). Motivated recruitment of autobiographical memories. Journal of Personality and Social Psychology, 59, 229-41.
24. Bahrick, Harry P, Lynda K Hall, and Stephanie A Berger. 1996. Accuracy and Distortion in Memory for High School Grades. Psychological Science 7, no. 5: 265-271.
25. Story, A. L. (1998). Self-esteem and memory for favorable and unfavorable personality feedback. Personality and Social Psychology Bulletin, 24: 51-64.
26. Swann, W. B., Jr. & Pelham, B. W. (2002). Who wants out when the going gets good? Psychological investment and preference for self-verifying college roommates. Journal of Self and Identity, 1, 219-233.
27. Cox, William T. L.; Abramson, Lyn Y.; Devine, Patricia G.; Hollon, Steven D. (2012). "Stereotypes, Prejudice, and Depression: The Integrated Perspective". *Perspectives on Psychological Science* **7** (5): 427–449.
28. "Psychology Glossary". Retrieved 7 March 2013.
29. Young, J. E. (1999) Cognitive therapy for personality disorders: A schema-focused approach. (rev ed.) Sarasota, FL: Professional Resources Press
30. Young, Klosko & Weishaar (2003), Schema Therapy: A Practitioner's Guide. New York: The Guilford Press.
31. Young, Jeffery. "American Psychological Association". Retrieved 28 February 2013.

Related Research Articles

Effect of Presentation and Sex in Script Memory Organization.
Mishra, Anupam; Social Science International, Vol 20(1), Jan 2004. pp. 12-20.
Abstract: In recent years, most of the researches have been focused on everyday context that is repeatedly and regularly experienced by an individual . In this study, eighty-four words were structured hierarchically into eight such routine activities (scripts) within three important seasons' categories. Forty undergraduates, 20 females and 20 males, aged 19-20 years, served as subjects in a 2×2×5 factorial design with mode of presentation (organized and randomized), sex (male and female) and five trials as this levels. The short-term recall was obtained after each five trials. Finding revealed a prominent role of script in ordering retrieval and enhancing the short-term recall. The recall was found far superior and more organized with organized than randomized presentation of TBR words. The superiority of males over females were also observed.

The effect of aging on script memory for typical and atypical actions.
Vakil, Eli; Mosak, Chaya; Ashkenazi, Mira; Applied Neuropsychology, Vol 10(4), Dec 2003. pp. 239-245.
Abstract: When typical and atypical information about a situation are presented, the atypical is found to be better recognized. This phenomenon is referred to as the "typicality effect." To test whether the typicality effect is age related, 41 younger and 36 older participants listened to two scripts that consisted of typical and atypical activities. The recognition was scored in two ways-with and without taking confidence rating into account. The two scoring systems yielded a similar pattern of results. Nevertheless, the weighted scores analyses were more sensitive to group differences than the unweighted scores. The older adults demonstrated typicality effect with the false alarm and hit rates corrected for false alarms scores but not with the hit rate score. A key factor in understanding the effect of age on the typicality effect is taking into consideration the conservative response bias found in the older group. The clinical contribution of these findings, in terms of assessment and remediation of age-related memory impairment, is discussed.

Sequencing and interleaving in routine action production.
Joe, Wilson Q.; Ferraro, Mary; Schwartz, Myrna F.; Neurocase, Vol 8(1-2), Feb 2002. pp. 135-150.

Abstract: Analyzed the sequence of steps enacted during the performance of routine action tasks in the context of the 2 x 3 test. This test requires enactment of 3 routine tasks, each performed twice. Data from 35 healthy controls and 16 closed head injury patients (aged 17-80 yrs) were analyzed to derive 'modal routes' through the 'sandwich', 'toast', and 'present' tasks, along with transition probabilities for the steps in the modal routes. Also investigated were the amount of interleaving and a potential structural constraint on interleaving. The results indicate that serial order production is more flexible than some might predict, and that the patients and controls were more similar than dissimilar on the measures taken. The 1st result argues against script architectures that are overly rigid. The 2nd implies that the vulnerability to sequence and other errors in this patient group is not due to defects in script memories or serial order programming.

Remembering specific episodes of a scripted event.
Farrar, M. Jeffrey; Boyer-Pennington, Michelle; Journal of Experimental Child Psychology, Vol 73(4), Aug 1999. pp. 266-288.
Abstract: Children's memory for a specific episode of a repeated event was investigated in 2 experiments. In Exp 1, 80 children (aged 4 or 7 yrs) experienced a standard novel event 1, 2, or 4 times, followed by an episodic event for those children who had multiple standard experiences. The episodic event involved the addition of both schema-typical and schema-atypical activities to the standard event. Following a 1-wk delay, children were asked to recall both event types. 4-yr-olds were more confused than older children regarding when the new activities had been experienced, although experience improved memory for the schema-atypical activities. 7-yr-olds were able to establish more accurate memories for both the schema-typical and the schema-atypical changes. For Exp 2, 12 additional 4-yr-olds who were recruited from the same pool as Exp 1 participated. Exp 2 demonstrated that 4-yr-olds could establish distinct memories for both types of changes when the standard event was simplified. The results are discussed in terms of the development of the relation between script memory and memory for a specific instance of an event.

The influence of postevent misinformation on children's reports of a unique event versus an instance of a repeated event. Connolly, Deborah Ann; Dissertation Abstracts International: Section B: The Sciences and Engineering, Vol 59(11-B), May 1999. pp. 6097.
Abstract: Much of what is known about the influence of postevent misinformation on children's event reports is based on studies in which children were exposed to the target event once. Nelson and her colleagues (e.g., 1986) have reported a considerable array of data that demonstrates that children's reports of a routine, or of an instance of a routine, is quite different from their reports of a unique event. Based on this literature on children's script memory it seemed reasonable to speculate that prior similar experiences with the target event would mitigate and/or heighten the influence of suggestions on children's reports of an instance of a routine. In Experiment 1, 4-, 6-, and 8-year-olds participated in one or four play sessions. Children in the 4-sessions condition (4-S) participated in play sessions on four consecutive days. During each session some target details remained the same (fixed) and some changed (variable). The single play session in the 1-session condition (1-S) was identical to the last play session in the 4-S condition. Three days later children were asked to think about the last play session and to answer related questions. Embedded in some of the questions were suggestions that things had happened during the final play session that had not occurred during any of the play sessions. Some of the suggestions related to fixed event details and some related to variable event details. Other questions presented neutral information about target details and served as control items. One day later, children were asked to think back to the final play session and to answer questions based on memory for it. Children were asked for free and cued recall and then to answer a set of "yes/no" recognition questions. Correct and incorrect responses were analyzed. Experiment 2 was similar to the 4-S condition of Experiment 1. Only 8-year-olds were tested and some different materials were used during the play sessions. In Experiment 1, the proportion of incorrect responses was higher for preschoolers than for older children, but age did not enter into any important interactions. Responses to questions about fixed items were more often correct and less often incorrect among children in the 4-S condition than among children in the 1-S condition. Responses to questions about variable suggested items were more often incorrect among children in the 4-S condition than among children in the 1-S condition. There was no effect of sessions on correct responses to questions about variable control items. In Experiment 2, children's responses to questions about variable details were substantially more often incorrect when the items were suggested than when they were

control. There was not a reliable suggested/control difference in responses to questions about fixed details. Children's script memory is used to interpret these data. Scripts are hypothesized to be abstract cognitive representations of what usually happens during an instance of a routine. Fixed details of a routine are proposed to be represented as part of the script. Memory for them is strong and, in the present study, children successfully resisted related suggestions. Memory for variable components of a routine is hypothesized to be a list-like set of experienced options that may be only loosely associated with particular instances. Children had difficulty resisting suggestions related to variable details of the routine.

The impact of traumatic events on eyewitness memory.
Yuille, John C.; Daylen, Judith*; In:* Eyewitness memory: Theoretical and applied perspectives. Thompson, Charles P.; Herrmann, Douglas J.; Read, J. Don; Bruce, Darryl; Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers, 1998. pp. 155-178.
[Chapter] Abstract: Present a proposed framework for the study of the impact of trauma and stress on eyewitness memory. The framework deals with (a) how the nature of the original event affects memory and (b) changes in memory over time. This framework yields a taxonomy of the varying qualities of eyewitness recall that includes 6 behavioral/emotional/cognitive patterns of eyewitness memory for criminal events: remarkable memories, dissociation during event, state-dependent amnesia, normal forgetting, script memory, dissociative amnesia, and active forgetting.

Fuzzy-trace theory and eyewitness memory.
Davies, Graham M.; Learning and Individual Differences, Vol 7(2), 1995. Special issue: A symposium on fuzzy-trace theory. pp. 111-114.
Abstract: Comments on V. F. Reyna and C. J. Brainerd's (see record 1995-39565-001) Fuzzy-Trace theory (FTT) and eyewitness memory (EWM). Evidence indicates that the reality of EWM should be recognized as FTT is extended into areas such as suggestibility and false memories. Such memories are unequivocally gist, yet according to FTT gist memories are well retained by adults and are much less susceptible to distortion than verbatim memories. The definition of gist must be unambiguous and should show how it relates to other ethereal entities such as scheme and scripts. Developmentally, scripts and more specific memories are closely interrelated whereas according to FTT, verbatim and gist memories are separately stored and individually accessed. The script memories precede and are derived from specific memories. This seems at variance with the FTT in which verbatim memories appear developmentally later than gist memories.

Memory for typical and atypical actions in scripted activities.
Graesser, Arthur C.; Woll, Stanley B.; Kowalski, Daniel J.; Journal of Experimental Psychology: Human Learning and Memory, Vol 6(5), Sep 1980. pp. 503-515.
Abstract: Describes 2 experiments in which 186 university students listened to stories containing scripted activities (e. g., eating at a restaurant) and later received a memory test on the actions. The actions varied in typicality with respect to the scripts. Memory performance at short retention intervals supported the representational assumptions of a "script pointer plus tag" hypothesis that predicts better memory discrimination for atypical than for typical actions and no memory discrimination for very typical actions. Results of Exp I indicate that the relatively poor memory for typical actions was not an artifact of Ss' circumventing memory retrieval; Ss did not prematurely decide that the typical actions "must have been presented." Exp II compared recall and recognition memory after different retention intervals. Assessments of both correct retrieval and guessing differed between recall and recognition tests. For both types of tests, the generic scripts played a more important role in guiding retrieval as the retention interval increased.

The impact of children's script memory on suggestibility.
Fasig, Lauren G.; Dissertation Abstracts International: Section B: The Sciences and Engineering, Vol 59(9-B), Mar 1999. pp. 5134.
Abstract: Suggestibility and recall performance regarding a specific occurrence of a controlled repeated event were examined. Twenty-four 4- to 5-year-olds and twenty-four 7- to 8-year-olds participated in repeated sessions of a novel event. Half of the children in each age group took part in 2 sessions, and half experienced 4 sessions. Items within the event were fixed across sessions, varied once, or always varied.

In a third or fifth session, children responded to a memory interview targeting the final game session. Questions in the interview focused on central and peripheral information, and item variability. Questions included misleading information that was either internal to the script or external to the script. The interview included 3 general probes, 12 direct probes, and 28 forced-choice questions. The forced-choice questions were divided equally into misleading and non-misleading questions. The older children were less suggestible than the younger children. However, as children recalled more they were also more suggestible. Additionally, the children made more script-consistent errors than external errors. Younger children were more suggestible for central than for peripheral information, but both age groups recalled more central information. As variability increased, suggestibility increased, although increased experience led to a different pattern of responding for older children. Additionally, the children were more suggestible in response to non-misleading questions rather than misleading questions. Results were interpreted in terms of script theory and the schema confirmation-deployment hypothesis, as well memory trace strength theory and source-monitoring theories. This is the first research to examine questions of age, information centrality, information variability, and level of recall as they pertain to both suggestibility and script memory in children.

TOPIC: Misattribution of Memory

The following text borrows extensively from Wikipedia, which offers a readable synopsis of ***misattribution of memory***.

Memory plays an important role in a number of aspects of our everyday lives and allows us to recall past experiences, navigate our environments, and learn new tasks [1]. From this view, information about a source of memory is assumed to contain certain characteristics that reflect the conditions under which the memory representations were attained [2]. Judgments about these sources are made by evaluating the amount and nature of the characteristics [2]. The accuracy of their recall varies depending on the circumstances at which they are retrieved [2]. Generally speaking, **Misattribution of Memory** involves source details retained in memory but erroneously attributing a recollection or idea to the wrong source [1]. Misattribution is likely to occur when individuals are unable to monitor and control the influence of their attitudes, toward their judgments, at the time of retrieval [3].Thus, memory is adapted to retain information that is most likely to be needed in the environment in which it operates [1]. Therefore, any misattribution observed is likely to be a reflection of current attitudes [3].

Misattribution is divided into three components; cryptomnesia, false memories, and source confusion. It was originally noted as one of Daniel Schacter's, *The Seven Sins of Memory* [4]. His book, *The Seven Sins of Memory: How the Mind Forgets and Remembers*, identifies misattribution as a type of memory distortion or inaccuracy [4]. For example, people may assert that they saw a face in one context when they actually encountered it in another [4].

Components of Misattribution

Cryptomnesia

Cryptomnesia occurs when a forgotten memory returns without it being recognized as such by the subject, who believes it is something new and original. It is a memory bias whereby a person may falsely recall generating a thought, an idea, a song, or a joke, not deliberately engaging in plagiarism but rather experiencing a memory as if it were a new inspiration.

In the first empirical study of cryptomnesia, people in a group took turns generating category examples (e.g., kinds of birds: parrot, canary, etc.). They were later asked to create new exemplars in the same categories that were not previously produced, and also to recall which words they had personally generated. People inadvertently plagiarized about 3–9% of the time either by regenerating another person's thought or falsely recalling someone's thought as their own. Similar effects have been replicated using other tasks such as word search puzzles and in brainstorming sessions.

Research has distinguished between two kinds of cryptomnesia, though they are often studied together. The distinction between these two types of plagiarism is in the underlying memory bias responsible—specifically, is it the thought that is forgotten, or the thinker? The first type of bias is one of familiarity. The plagiarizer regenerates an idea that was presented earlier, but believes the idea to be an original creation. The idea that is reproduced could be another's idea, or one's own from a previous time. B. F. Skinner describes his own experience of self-plagiarism:

> "One of the most disheartening experiences of old age is discovering that a point you just made—so significant, so beautifully expressed—was made by you in something you published long ago."

The second type of cryptomnesia results from an error of authorship whereby the ideas of others are remembered as one's own. In this case, the plagiarizer correctly recognizes that the idea is from an earlier time, but falsely remembers having been the origin for the idea (or, having lost

the specific memory of encountering it in print or conversation, assumes that it "came to" the plagiarizer as an original idea). Various terms have been coined to distinguish these two forms of plagiarism — occurrence forgetting vs. source forgetting and generation errors vs. recognition errors. The two types of cryptomnesia appear to be independent: no relationship has been found between error rates and the two types are precipitated by different causes.

Cryptomnesia is more likely to occur when the ability to properly monitor sources is impaired. For example, people are more likely to falsely claim ideas as their own when they were under high cognitive load at the time they first considered the idea. Plagiarism increases when people are away from the original source of the idea, and decreases when participants are specifically instructed to pay attention to the origin of their ideas. False claims are also more prevalent for ideas originally suggested by persons of the same sex, presumably because the perceptual similarity of the self to a same-sex person exacerbates source confusion. In other studies it has been found that the timing of the idea is also important: if another person produces an idea immediately before the self produces an idea, the other's idea is more likely to be claimed as one's own, ostensibly because the person is too busy preparing for their own turn to properly monitor source information.

False Memories

False memories occur when a person's identity and interpersonal relationships are strongly centered around a memory of an experience that did not actually take place [7]. These false memories are often of a traumatic life experience and can become very detrimental to everyday life. False Memories are often the result of leading questions in a therapeutic practice termed Recovered Memory Therapy [8]. In this practice, psychiatrists often put their patients under hypnosis to recover suppressed memories. This can be detrimental, as the individual may recall memories that never occurred. For example, there are instances of reported cases in which individuals falsely recall sexual abuse and pursue justice. These cases are extremely painful to both the accuser and to the accused, and may result in wrongful conviction. Due to incidents like these, false memories and repressed memories have lost most of their validity and reliability in a court of law [8].

Source Confusion

Source confusion occurs when an individual misattributes a source of a memory [9]. Understanding the source of one’s memories is important to memory processes necessary for every day living. In one particular case of source confusion, a female rape victim falsely accused a memory doctor of being her rapist. In this case, the doctor had made a television appearance seen by the female victim prior to her attack. The women misattributed the doctor’s face with that of her attacker [8].

An additional example of source confusion involves Ronald Reagan. In this instance, Ronald Reagan tells a story about a heroic pilot to whom he personally awarded a medal [8]. However, he was actually recalling the story line from a theatrical production entitled “Wing and a Prayer” [8]. Reagan misattributed a real life experience with one he had actually seen in a movie. However, he strongly believed that he was involved in the medal process to this war hero.

A **source monitoring error** is a type of memory error where a specific recollected experience is incorrectly determined to be the source of a memory. This error occurs when normal perceptual and reflective processes are disrupted, either by limited encoding of source information or by disruption to the judgment processes used in source-monitoring. Depression, high stress levels and damage to relevant brain areas are examples of factors that can cause such disruption and hence source-monitoring errors.

One of the key ideas behind source monitoring is that rather than receiving an actual label for a memory during processing, a person's memory records are activated and evaluated through decision processes; through these processes, a memory is attributed to a source. Source monitoring relies heavily on the individual's activated memory records; if anything prevents encoding the contextual details of an event while it happens, relevant information will not be fully retrieved and errors will occur. If the attributes of memory representations are highly differentiated, then fewer errors are expected to occur and vice versa. Two cognitive judgment processes exist regarding source monitoring; these are commonly called *heuristic* and *systematic* judgement processes.

Heuristic judgments are made quickly without the conscious awareness of the individual, making use of perceptual, contextual, and other event-related information. These occur more frequently because they are efficient and occur automatically without the individual putting forth conscious effort. A decision is made about a source when relevant information is of a certain significance and the memory occurring at a certain time or place makes sense logically; errors then occur based on the amount of information stored at encoding or the way that an individual's brain makes decisions based on prior experiences. Within the source-monitoring framework, "heuristic" is a type of decision process; this term is directly related to the psychological heuristics.

Systematic judgments are decision processes whose procedures are accessed consciously by the individual; the same types of information used in heuristic judgments are also used in systematic judgments. In this process, all memory-relevant information is retrieved from memory and assessed deliberately to determine whether a memory is likely to have come from a specific source. Systematic judgments occur less frequently in source judgments because they are slow and require a lot of conscious effort. Errors occur due to a misassignment of the weight of certain aspects of memories: assigning high importance to visual information would mean that having poor details of this aspect would be cause for an assumption that the event didn't happen or was imagined. Errors will occur if an individual's subjective logic leads them to perceive an event as unlikely to occur or belong to a specific source, even if the truth was otherwise. Simple memory decay can be a source for errors in both judgments, keeping an individual from accessing relevant memory information, leading to source-monitoring errors.

There are three major types of source monitoring: external source monitoring, internal source monitoring, and reality monitoring, all of which are susceptible to errors and make use of the two judgment processes.

External source monitoring: This type of source monitoring focuses on discriminating between externally retrieved sources, such as events happening in the world surrounding the individual. An example of this would be determining which one of the individual's friends said something rude.

Internal source monitoring: This type of source monitoring focuses on discriminating between internally derived sources, such as the individual's memories. An example of this would be differentiating between memories of thought ideas and spoken ideas.

Reality monitoring: This type, also known as *internal-external reality monitoring*, is derived from the previous two types and focuses on discriminating between internally and externally retrieved sources. An example would be discriminating a plane crashing into a building portrayed in real life and on a newspaper.

Cogitive Causes

Causes of Cryptomnesia

Cryptomnesia is a source-monitoring error in which people often have difficulty determining whether a concept was internally generated or experienced externally. People occasionally misattribute the creation of a novel thought or idea as their own, when in fact they are retrieving it from a previous experience. Some individuals fail to establish memories with enough detail to generate a source attribution, causing a misattribution of memory to the wrong source [10]. People often truly believe that the information they plagiarized was actually that of their own.

Unintentional plagiarism is greater for information generated by others than ourselves. Researchers believe this may due to having better memory and associations for words we generate, as self-generated information is better remembered later [11]. Moreover, cryptomnesia increases when information is generated by others before a self-generated idea. This may be due to the likelihood that people were thinking of their next response, rather than processing the source of the information [12].

Causes of false memories

False recognition can occur as the result of making an implicit associative response, an automatic association between two concepts in memory [4]. It is believed that associative responses never come to conscious attention, thus the activation of the concept is assumed to be implicit [4]. An implicit associative response has shown to arise when seeing a word such as "car", might cause people to unconsciously think of an associative such as "truck". If the word truck is later presented to them, they may state they recognize seeing the item when they had actually generated it themselves. It is believed that the activation from the shown word may also activate the associative word, allowing the information to be easily accessible to the mind [13]. Research has also shown that the more similar the presented and associative words are, or the more similar list items there are, the more likely it is that a false recognition error will be made [4].

Gist-based similarity, the robust encoding of semantic information rather than distinctive encoding,[4] is another cause of false recognition. When studying a list of numerous related words, there is a high level of semantic overlap between memory items. The inability to keep each concepts separate and distinct from one another makes it difficult to recollect specific details, subsequently causing people to make responses based on memory gist's rather than specific details. People may form a well-organized idea of what the semantic gist is, and anything that is semantically similar to that idea may be falsely recognized. Gist-based similarity has also been shown to occur in circumstances in which implicit associative responses are an unlikely source of misattribution [4].

The false recognition error also becomes evident when a time pressure is presented during a recognition decision.[14] Processes that work to discover a source for the basis of recognition take time to execute, as a result of a lack of time, false recognitions errors are made more often.
It has also been noted that misattribution may be a product of adaptive features of memory, rather than a product of a flaw in the memory system. The misattribution error often leads to conclusions of an inefficient memory system, however some researchers believe that the error is a cost associated with the benefits of a functioning and adequate memory system [4]. The misattribution error reflects an adaptive memory system in which information that does not require people to remember all the specific details is lost. Specific details would only be preserved in situations where the specific details need to be remembered, such as memories of a highly emotional experience.[4] The use of semantic gists may be a fundamental mechanism of

memory, allowing people to categorize information and generalize across situations, a function associated with higher intelligence.[4]

Neurological Causes

Neurological Basis of False Recognition

Brain-damaged patients have provided useful insights into the underlying biological mechanisms involved in false recognition. Results from studies comparing levels of false recognition between patients with frontal lobe damage and age-matched controls, showed a significantly higher level of false recognition amongst the frontal lobe damaged individuals [4]. The damage is believed to have caused disruptions in the adequate encoding of item-specific details or caused defective retrieval monitoring processes. These types of processes are needed to accurately recall the origins of memory representations, and without them, errors of origin can be made. Studies of false recognition in amnesic patients with damage to either the medial temporal lobe or other diencephalon structures, have demonstrated that the same processes involved in accurate recognition, are also involved in false recognition [4]. These cortices play a role in strategic monitoring processing, as they attempt to examine other cortical outputs. If these cortices were damaged, there would be no control over the cortical outputs, increasingly the likelihood of a false recognition error. Additionally, patients suffering from amnesia or Alzheimer's disease have a reduced level of false recognition, believed to be caused by taking too many trials to create the semantic gist information needed for the attribution error [4].

False Memories and PET Scans

A follow-up to the previous research was conducted by Daniel L. Schacter and colleagues. Similar to the study by Henry L. Roediger and Kathleen McDermott, subjects were read a list of associated words before they went into the PET scanner. During the first scan, subjects would make recognition judgments to determine what were the previous presented words [4]. During the second scan, subjects had to make judgments about words that were not presented. For example: bed, rest, dream, tried, and awake would be in the list but not the word "sleep". As with the study by Henry L. Roediger and Kathleen McDermott, subjects claimed to remember similar amounts of non-presented words as they did the words that were actually presented[4]. The researchers noted that brain activity during the true and false recognition tasks were very similar. Monitoring the blood flow in the brain revealed there were in the left medial temporal lobe for both veridical and illusory recognition[15].

That is not to say that there were not differences. While monitoring blood flow in the brain during false recognition, a part of the frontal lobe that is thought to be a key monitor of memories actually showed greater activity when presented with a false recognition than with a true one[4]. There seemed to be some discrepancy as subjects attempted to scrutinize the out-placed words, but were overcome by powerful memory illusion[4]. This study demonstrates the ability of technology to help researchers understand to a greater extent the power of false memories.

Source Confusion and FMRI Scans

T. Awipi and L. Davachi sought to provide evidence of competing subregions in the medial temporal lobe (MTL) that differed on the type of content they encoded. The researchers conducted a study in which subjects were asked to perform an encoding task in a functional magnetic resonance imaging (FMRI) scanner, where they were presented with 192 full colour photographs of scenes (containing a centrally presented novel scene and a smaller image of one of six objects). Participants were also instructed to imagine using the presented object in each scene, and were asked to report whether they were successful. A memory test was administered after participants were removed from the scanner. The test consisted of all previously viewed

scenes (old) and an equal number of novel scenes (new). They were asked to make an old/new judgement, and if the scene was responded as being old, they were asked to report is as being "remembered" or "familiar". They were then asked to pick an object that was paired with that scene. The researchers were trying to determine the levels of activation for source recollection for the objects paired with the scene during encoding [16].

The researchers found that perirhinal cortex activation was greater for objects recalled, and parahippocampal cortex activation was greater when scenes were recalled [16]. The results provide evidence of distinct encoding activation in the subregions of the medial temporal lobe [16]. The first subregion is the perirhinal cortex, which encodes item information. The second subregion, the parahippocampal cortex, is involved in source information. The evidence provides support for the role of the right perirhinal cortex in attributing an object to the right source [16]. As decreased activation was associated with poorer performance, decreased activation of the right perirhinal cortex could be a possible mechanism for source confusion.

Experimental Research

Misattribution

In one of the earliest studies involving misattribution, the Canadian cognitive psychologist Bruce Whittlesea presented subjects with a list of common words. Each word was briefly displayed to the subject [4]. The task required the subject to judge whether a target word was semantically related to any word in the list[17]. Unlike Whittlesea's first experiment involving the recognition of target words, this study involved the manipulation of processing fluency through the conceptual context of the target word, rather than the physical context[17]. After the subjects were given a brief moment to study the list of words, the subjects were presented with sentences that would contain a word that was capitalized at the end of the sentence that would have either been, or not been, from the previously presented list. The word at the end of the sentence was either highly predictable given the context of the sentence, for example: "The stormy seas tossed the BOAT", or the end word was less predictable such as: "She saved her money and bought a LAMP"[4]. The subjects were then required to state whether the capitalized end word had appeared, or not, on the previous list of words. If not, they were to respond by saying that the word was "new" versus it being "old".

The study revealed that the new words that were highly predictable were more likely to be incorrectly identified as being previously seen, whereas the new words that were less predictable were not so identified [4].In fact, subjects actually named predictable words faster than they did unpredictable words. Whittlesea was able to conclude from this study that subjects misattributed their fast responses for highly predictable words as an indication that they had previously experienced the word whereas in fact that was incorrect. As a result, the fluency of processing caused the subjects to misinterpret their quickness as a case of familiarity [4].

Cryptomnesia

Some of the most common experimental designs in the study of cryptomnesia involve solving word puzzles. One such study from Stanford University in 1993 monitored subjects' memory for solutions found to a word puzzle game when paired against a computer opponent. After several rounds of generating solutions in turn, participants were asked to generate a list of solutions they provided themselves, or a list of new solutions and rate their confidence in the source of each solution listed [5]. Subjects were more likely to plagiarize solutions given by the computer opponent than their own solutions after indicating that they were very confident that the solution was truly novel; when subjects indicated that they were "guessing" whether the solution had been seen before, they were more likely to duplicate solutions they had found during the first round of the test.

In an extension of this test, after each puzzle solution was generated, participants were asked one of two questions: is this word greater than 3 letters long? (physical judgement) or does this word have a positive connotation? (semantic judgement). Participants then generated lists of solutions as in the first test. While the same correlation of confidence level and error type were seen, participants were much more likely to plagiarize answers after making a physical judgement as compared to a semantic one [5].

False Memories

Researchers Henry L. Roediger and Kathleen McDermott conducted an experiment in 1995 that dealt with a procedure developed by James Deese. This procedure, known as the Deese-Roediger-McDermott paradigm, invites subjects to believe they have experienced a particular word in a given list [4]. The subjects are read a list of associated words by the experimenter. These associated words could be for example: bed, rest, dream, tried, awake, etc. [4][13]. After the subjects have heard these words, they are required to engage in a free recall task in which they must list the words they have heard. The researchers carried out two experiments. The first one involved six lists of associated words. The second experiment involved a wider set of materials, in which twenty-four 15-item lists where read to the subjects [13].

The results of both experiments demonstrated that the subjects were confident about their incorrect answers regarding words heard in the list. For example, given the list; bed, rest, dream, tried, awake. Many of the subjects heard “sleep” which was not one of the words presented. This false memory effect occurs because the words associated with sleep are in the list leading subjects to believe that the words associated with the words provided in the list have to be right. In fact, with the second experiment the results were 55% false recall rate compared to 40% for the first experiment [13]. This indicated that the more words and lists available the harder it is to actually recall words correctly [13]. This experiment illustrates how subjects can provide false recall without noticing their errors. Even after the researchers indicate that they did not say the mistaken words, subjects still felt very convinced that the researcher had said the word.

False memories can also be created through leading questioning and simple use of imagination[18]. In 1996, Ira Hyman Jr. and Joel Petland published a study showing that subjects can falsely 'remember' anecdotes from their childhood, based on suggestions from the researcher and corroboration of these fictitious events from family members [19]. Subjects' parents were interviewed to create a list of memorable childhood events (vacations, instances of being lost, etc.), to which one false event was added, namely spilling a bowl of punch at wedding reception. For each event, subjects were provided with several cues to aid in memory (age at the time, location, nature of the event, etc.) and asked to describe the situation in as much detail as possible. If a participant was unable to recall any event, they were asked either to quietly think about the event for about a minute and then provide any additional information remembered (control condition) or imagine the event happening and describe the people who would have been involved, what the location would have looked like and how the event might have occurred (imagery condition).

After three interviews in this fashion, 25% of participants from the imagery condition reported remembering the false situation of spilling the punch bowl, as compared to fewer than 10% of subjects in the control condition [19]. An overall improvement in the detail of responses given and the confidence of those responses was observed for both true and false memories in the imagery condition, while those in the control condition showed much less improvement. While participants who 'remembered' the false situation rated this event as being less emotionally

intense than the other remembered true events, participants rated their confidence in accurately remembering the false scenario than any of the true events.

References

1. Schacter, D. L. & Dodson, C. S. (2001). Misattribution, false recognition and the sins of memory. Philosophical Transactions of the Royal Society: Biological Sciences; 356, 1385-1393
2. Zaragoza, M. S. & Lane, S. M. (1994). Sources of misattribution and suggestibility of eye witness testimony. Journal of Experimental Psychology: Learning, Memory, and Cognition; 20, pp.934-945.
3. Payne, B. K., Cheng, C. M., Govorun, O., & Stewart, B. D. (2005). An Inkblot for Attitudes: Affect Misattribution as Implicit Measurement. Journal of Personality and Social Psychology; 89, pp.277-293.
4. Schacter, Daniel L. (2001). The Seven Sins of Memory. New York, NY: Houghton Mifflin Company.
5. Marsh, R. L. & Bower, G. H. (1993). Eliciting Cryptomnesia: Unconscious Plagiarism in a Puzzle Task. Journal of Experimental Psychology: Learning, Memory, and Cognition; 19, pp.673-688.
6. Brown, A. S., & Halliday, H. E. (1991). Cryptomnesia and source memory difficulties. American Journal of Psychology, 104, 475–490.
7. Depue, B. E. (2010). False Memory Syndrome. The Corsini Encyclopedia of Psychology.
8. Laura. 2011. False Memories: Source Confusion and Suggestion. The Strangest Situation. http://thestrangestsituation.blogspot.com/2011/02/false-memories-source-confusion-and.html
9. List of Memory Biases. Wikipedia, the free encyclopedia
10. Johnson, Marcia K., Hashtroudi, Shanin, Lindsay, Stephan. (1993). Source Monitoring. Psychology Bulletin, 114(1), 3-28.
11. Defeldre, Anne-Catherine. (2005). Inadvertent Plagiarism in Everyday Life. Applied Cognitive Psychology, 19, 1-8.
12. Marsh, Richard L., Landau, Joshua D., Hicks, Jason L. (1997) Contributions of inadequate Source Monitoring to Unconscious Plagiarism During Idea Generation. Journal of Experimental Psychology, 23(4), 886-887.
13. Roediger, Henry L., McDermott, Hathleen B. (1995) Creating False Memories: Remembering Words Not Presented in Lists. Journal of Experimental Psychology: Learning, Memory, and Cognition, 41(4), 803-814.
14. Benjamin, Aaron S. (2001). On the Dual Effects of Repetition on False Recognition. Journal of Experimental Psychology: Learning, Memory, and Cognition, 27(4), 941-946.
15. Schacter, Daniel L., Reiman, Eric, Curran, Tim, Yun, Lang S., Bandy, Dan, McDermott, Kathleen B., Roediger, Henry L. (1996). Neuroanatomical Correlates of Veridical and Illusory Recognition Memory: Evidence from Positron Emission Tomography. Neuron, 17, 267-274.
16. Awipi, T., & Davach, L. (2008). Content-Specific Source Encoding in the Human Medial Temporal Lobe. Journal of Experimental Psychology, 34, 769-779
17. Whittlesea, Bruce W. A. (1993). Illusions of Familiarity. Journal of Experimental Psychology: Learning, Memory, and Cognition, 19[6], 1235-1253.
18. Henkel, L.A., Franklin, N. & Johnson, M.K. (2000). Cross-Modal Source Monitoring Confusions Between Perceived and Imagined Events. Journal of Experimental Psychology: Learning, Memory, and Cognition, 21(6) , 321–335.
19. Hyman I.E. Jr, & Pentland J. (1996). The role of mental imagery in the creation of false childhood memories. Journal of Memory and Language 35:101–17

Articles on Misattribution Error

Emotion, directed forgetting, and source memory.

Otani, Hajime, Libkuman, Terry M., Goernert, Phillip N., Kato, Koichi, Migita, Mai, Freehafer, Sarah E., Landow, Michael P., British Journal of Psychology, Vol 103(3), Aug, 2012. pp. 343-358.

Abstract:

We investigated the role of emotion on item and source memory using the item method of directed forgetting (DF) paradigm. We predicted that emotion would produce source memory impairment because emotion would make it more difficult to distinguish between to-be-remembered (R items) and to-be-forgotten items (F items) by making memory strength of R and F items similar to each other. Participants were presented with negatively arousing, positively arousing, and neutral pictures. After each picture, they received an instruction to remember or forget the picture. At retrieval, participants were asked to recall both R and F items and indicate whether each item was an R or F item. Recall was higher for the negatively arousing than for the positively arousing or neutral pictures. Further, DF occurred for the positively arousing and neutral pictures, whereas DF was not significant for the negatively arousing pictures. More importantly, the negatively arousing pictures, particularly the ones with violent content, showed a higher tendency of producing **misattribution errors** than the other picture types, supporting the notion that negative emotion may produce source memory impairment, even though it is still not clear whether the impairment occurs at encoding or retrieval.

Overdistribution in source memory.
Brainerd, C. J., Reyna, V. F., Holliday, R. E., Nakamura, K., Journal of Experimental Psychology: Learning, Memory, and Cognition, Vol 38(2), Mar, 2012. pp. 413-439.
Abstract:
Semantic false memories are confounded with a second type of **error**, overdistribution, in which items are attributed to contradictory episodic states. Overdistribution **errors** have proved to be more common than false memories when the 2 are disentangled. We investigated whether overdistribution is prevalent in another classic false memory paradigm: source monitoring. It is. Conventional false memory responses (source **misattributions**) were predominantly overdistribution **errors**, but unlike semantic false memory, overdistribution also accounted for more than half of true memory responses (correct source attributions). Experimental control of overdistribution was achieved via a series of manipulations that affected either recollection of contextual details or item memory (concreteness, frequency, list order, number of presentation contexts, and individual differences in verbatim memory). A theoretical model was used to analyze the data (conjoint process dissociation) that predicts that (a) overdistribution is directly proportional to item memory but inversely proportional to recollection and (b) item memory is not a necessary precondition for recollection of contextual details. The results were consistent with both predictions.

Imagery encoding and false recognition errors: Examining the role of imagery process and imagery content on source misattributions.
Foley, Mary Ann, Foy, Jeffrey, Schlemmer, Emily, Belser-Ehrlich, Janna, Memory, Vol 18(8), Nov, 2010. pp. 801-821.
Abstract:
Imagery encoding effects on source-monitoring **errors** were explored using the Deese-Roediger-McDermott paradigm in two experiments. While viewing thematically related lists embedded in mixed picture/word presentations, participants were asked to generate images of objects or words (Experiment 1) or to simply name the items (Experiment 2). An encoding task intended to induce spontaneous images served as a control for the explicit imagery instruction conditions (Experiment 1). On the picture/word source-monitoring tests, participants were much more likely to report "seeing" a picture of an item presented as a word than the converse particularly when images were induced spontaneously. However, this picture **misattribution error** was reversed after generating images of words (Experiment 1) and was eliminated after simply labelling the items (Experiment 2). Thus source **misattributions** were sensitive to the processes giving rise to imagery experiences (spontaneous vs deliberate), the kinds of images generated (object vs word images), and the ways in which materials were presented (as pictures vs words).

Remembering what we did: How source misattributions arise from verbalization, mental imagery, and pictures.
Henkel, Linda A., Carbuto, Michelle, Applied memory. Kelley, Matthew R. (Ed.); pp. 213-234. Hauppauge, NY, US: Nova Science Publishers, 2009. ix, 337 pp.
Abstract:

(from the chapter) Memory **errors** in everyday life are pervasive and can range from being minor inconveniences to having significant consequences. At the root of many memory **errors** are source **misattributions** in which a person mistakenly claims that the source of a remembered event was something other than what it actually was (e.g., a person claiming to have performed an action that he or she merely thought about completing; erroneously remembering that he or she saw an event when he or she actually only read about it or saw pictures of it). The present chapter examines how source **misattributions** can create false beliefs and memories in which people claim that they did things that they actually did not. The role of three different but related everyday experiences in the creation of such memory **errors** is explored in depth—hearing or talking about various experiences, engaging in mental imagery, and viewing photographs—followed by presentation of a new study examining how photographs can lead to false claims of having committed actions that were not actually performed.

Schema-driven source misattribution errors: Remembering the expected from a witnessed event.
Kleider, Heather M., Pezdek, Kathy, Goldinger, Stephen D., Kirk, Alice, Applied Cognitive Psychology, Vol 22(1), Jan, 2008. pp. 1-20.
Abstract:
When recollection is difficult, people may use schematic processing to enhance memory. Two experiments showed that a delay between witnessing and recalling a visual sequence increases schematic processing, resulting in stereotypic memory **errors**. Participants watched a slide show of a man and a woman performing stereotype-consistent and stereotype-inconsistent actions, followed by an immediate or delayed memory test. Over a two-day delay, stereotype-inconsistent actions were increasingly misremembered as having been performed by the stereotype-consistent actor (Experiment 1). All the source **errors** increased, regardless of stereotype consistency, when the wrong actor was suggested. When we merely suggested that 'someone' performed an action (Experiment 2), only stereotype-consistent source **errors** were increased. Although visual scenes are typically well remembered, these results suggest that when memory fades, reliance on schemata increases, leading to increased stereotypic memory **errors**.

Source monitoring in eyewitness memory: Implicit associations, suggestions, and episodic traces.
Hekkanen, Steve T., McEvoy, Cathy, Memory & Cognition, Vol 33(5), Jul, 2005. pp. 759-769.
Abstract:
Both the distinctiveness heuristic and discrepancy detection hypotheses were investigated by independently manipulating both schema consistency and incidental suggestion hi an eyewitness memory paradigm. A sequence of slides was shown, followed by a postevent questionnaire that contained both schema-typical and schema-atypical information. Fifteen minutes later, a source-monitoring task was administered. In Experiment 1, the proportion of source **misattribution errors** was greater for schema-typical items than for schema-atypical items, and the proportion of **errors** on suggested items was greater than that on control items. Suggestion affected schema-typical and schema-atypical items equally, providing no support for the predictions of either hypothesis. In Experiment 2, the interval between the questionnaire and the source test was manipulated. The results of Experiment 1 were replicated under the short delay, whereas the proportion of **errors** increased under the long delay. An associative network model involving two types of episodic traces was used to account for the results.

Emotional content and reality-monitoring ability: fMRI evidence for the influences of encoding processes.
Kensinger, Elizabeth A., Schacter, Daniel L., Neuropsychologia, Vol 43(10), 2005. pp. 1429-1443.
Abstract:
Memory for emotional items can be less prone to some types of memory distortion, such as reality-monitoring **errors**, than memory for neutral items. The present fMRI study examined whether this enhanced reality-monitoring accuracy reflects engagement of distinct processes recruited during encoding of emotional information. Participants only imagined named objects (word-only trials) or imagined named objects and then also viewed photos of them (word-picture trials). Half of the items were emotional (e.g., snake, casket). Later, participants heard object names and indicated whether the corresponding photo had been shown. Reality-monitoring **errors** occurred when participants attributed an item from a word-only trial to a word-picture trial. Such **misattribution errors** occurred less frequently

for emotional than neutral items. Activity in emotion-processing regions (e.g., orbitofrontal cortex, amygdala) reduced the likelihood of later **misattributions**, likely due in part to interactions with regions that promote memory accuracy (e.g., the hippocampus). Distinct neural processes also increased the likelihood of reality-monitoring **errors**, depending on the emotional content of the items. Activity spanning the fusiform and parahippocampal gyri (likely reflecting mental imagery) increased the likelihood of reality-monitoring **errors** for neutral items, while activity in the anterior cingulate increased the likelihood of reality-monitoring **errors** for emotional items.

Schema reliance in source monitoring: The impact of aging and emotional focus.
Mather, Tamar Esther Mara, Princeton U., US
Dissertation Abstracts International: Section B: The Sciences and Engineering, Vol 61(5-B), Nov, 2000. pp. 2791.
Abstract:
Three experiments investigated the interplay of emotion and aging on reliance on schematic knowledge when remembering. Of additional interest was whether older adults' reliance on schematic knowledge is associated with declines in reflective processes supported by frontal brain regions. For generality, these issues were investigated in three types of situations: memory for a story (Experiment 1), memory for who said what (Experiment 2), and memory for options from past choices (Experiment 3). The same three findings emerged across each of these different types of situations. First, younger adults (17-26 yrs) asked to focus on how they feel about an event later relied more on their schematic knowledge when attributing information to the event than did younger participants who had not focused on their feelings. Second, in the conditions that did not require emotional self-focus, older adults (62-85 yrs) showed more schema reliance than did younger adults. Third, this increased reliance for older adults in the non emotional self-focus conditions was negatively correlated with a measure of frontal brain region or executive function. This pattern of results suggests that both emotional focus and age-related changes increase schema reliance when making source judgements about a previously-experienced event. Relying on general knowledge about an event can be a useful strategy to help fill in gaps in memory or to avoid more effortful extended retrieval. However, schema reliance can also result in memory source **misattributions**. The source **misattributions** associated with schema reliance are most likely due to a combination of factors, including disruption of the reflective processing required to encode and consolidate source-specifying information, increased associations that may later be misattributed to the event itself, and shifts in which aspects of the event are focused on. Schematic knowledge in memory attributions plays an important role in helping people remember information. However, reliance on schematic information can lead to memory **misattribution errors** that are especially pernicious because they seem so plausible.

Escape from illusion: Reducing false memories.
Dodson, Chad S., Koutstaal, Wilma, Schacter, Daniel L.
Trends in Cognitive Sciences, Vol 4(10), Oct, 2000. pp. 391-397.
Abstract:
Illusory memories are unsettling, but far from uncommon. Over the past several years, increasing experimental and theoretical attention has focused on **misattribution errors** that occur when some form of memory is present but attributed to an incorrect time, place or source. Demonstrations of **errors** and distortions in remembering raise a question with important theoretical and practical implications: how can memory **misattributions** be reduced or avoided? We consider evidence that documents the occurrence of illusory memories, particularly false recognition responses, and then review three ways in which memory distortion can be minimized.

The aboutness principle: A pervasive influence on human inference.
Higgins, E. Tory
Social Cognition, Vol 16(1), Spr, 1998. Special issue: Naive theories and social judgment. pp. 173-198.
Abstract:
When people perceive a response (or outcome), whether their own or another person's, they represent it as being about something, and this thing that the response is about is inferred to be the source of the response. The first section of this article discusses natural assumptions underlying the operation of this aboutness principle and describes the problems with its use, illustrated by such well-established cases of

social-cognitive shortcomings as the correspondence bias, representativeness **error**, **misattribution**, accessibility bias, and saying-is-believing effect. The second section uses the aboutness principle to review lay psychological theories discussed in this special issue, including people's theories of causality, stability, and change in personal attributes, conditions for valid memories or judgments, group attribute clusters, and persuasive influences.

Repeatedly thinking about a non-event: Source misattributions among preschoolers.
Ceci, Stephen J., Huffman, Mary, Lyndia Crotteau, Smith, Elliott, Loftus, Elizabeth F.
The recovered memory/false memory debate. Pezdek, Kathy (Ed.); Banks, William P. (Ed.); pp. 225-244. San Diego, CA, US: Academic Press, 1996. xv, 394 pp.
Abstract:
(from the chapter) review the factors alleged to be responsible for the creation of inaccurate reports among [3–6 yr olds], focusing on so-called "source **misattribution errors**" / present the 1st round of results from an ongoing program of research that suggests that source **misattributions** could be a powerful mechanism underlying children's false beliefs about having experienced fictitious events / very young children may be disproportionatly vulnerable to these kinds of **errors** [this is] discussed in the context of the ongoing debate over the veracity and durability of delayed reports of early memories, repressed memories, dissociative states, and the validity risks posed by therapeutic techniques that entail repeated visually guided imagery inductions

Appropriating the actions of another: Implications for children's memory and learning.
Foley, Mary Ann, Passalacqua, Carmella, Ratner, Hilary H.
Cognitive Development, Vol 8(4), Oct-Dec, 1993. pp. 373-401.
Abstract:
Perspectives on reality monitoring and sociocultural learning were integrated in 4 experiments concerning children's memory of contributions to the outcomes of collaborative exchanges. 204 children (aged 4 yrs to 8 yrs 11 mo) made collages with an adult and were later surprised with a reality-monitoring task in which they were asked to remember who placed particular pieces on the collage. In Exps 1–3, 4-yr-olds were more likely to claim they contributed pieces that the adult actually contributed rather than the reverse. This bias was interpreted as evidence for appropriation, a process in which individuals adopt another person's actions as their own. The extent to which Ss committed **misattribution** (MA) **errors** depended on their involvement as decision makers (Exps 1 and 3) and on the outcomes of the collages themselves (Exp 2). Exp 4 demonstrated the importance of shared exchanges for producing the MA **errors** observed in Exps 1–3.

TOPIC: Suggestibility

The following text borrows extensively from Wikipedia, which offers a helpful synopsis of ***suggestibility***.

Suggestibility is the quality of being inclined to accept and act on the suggestions of others. A person experiencing intense emotions tends to be more receptive to ideas and therefore more suggestible. Generally, suggestibility decreases as age increases. However, psychologists have found that individual levels of self-esteem and assertiveness can make some people more suggestible than others, which has resulted in the concept of a spectrum of suggestibility.

Definition

Attempts to isolate a global trait of "suggestibility" have not been successful, due to an inability of the available testing procedures to distinguish measurable differences between the following distinct types of "suggestibility":[1]

- To be affected by a communication or expectation such that certain responses are overtly enacted, or subjectively experienced, without volition, as in automatism.
- Deliberately to use one's imagination or employ strategies to bring about effects (even if interpreted, eventually, as involuntary) in response to a communication or expectation.
- To accept what people say consciously, but uncritically, and to believe or privately accept what is said.
- To conform overtly to expectations or the views of others, without the appropriate private acceptance or experience; that is, to exhibit behavioral compliance without private acceptance or belief.

Wagstaff's view is that, "*a true response to* [a hypnotic] *suggestion is not a response brought about at any stage by volition,*[a] *but rather a true nonvolitional response,* [and] *perhaps even brought about despite volition*",[1] the first category really embodies the true domain of hypnotic suggestibility. Self-report measures of suggestibility have made it possible to isolate and study the global trait.[3]

Suggestibility and hypnosis

The extent to which a subject may or may not be "suggestible" has significant ramifications in the scientific research of hypnosis and its associated phenomena. Most hypnotherapists and academics in this field of research work from the premise that hypnotisability (or suggestibility) is a factor in inducing useful hypnosis states. That is, the depth of hypnosis a given individual can achieve in a given context with a particular hypnotherapist and particular set of beliefs, expectations and instructions.

Dr. John Kappas (1925–2002) identified three different types of suggestibility that have improved hypnosis:

- **Emotional Suggestibility** A suggestible behavior characterized by a high degree of responsiveness to inferred suggestions that affect emotions and restrict physical body responses; usually associated with hypnoidal depth. Thus the emotional suggestible learns more by inference than by direct, literal suggestions.
- **Physical Suggestibility** A suggestible behavior characterized by a high degree of responsiveness to literal suggestions affecting the body, and restriction of emotional responses; usually associated with cataleptic stages or deeper.
- **Intellectual Suggestibility** The type of hypnotic suggestibility in which a subject fears being controlled by the operator and is constantly trying to analyze, reject or rationalize everything the operator says. With this type of subject the operator must give logical explanations for every suggestion and must allow the subject to feel that he is doing the hypnotizing himself.

However, it is not clear or agreed what suggestibility (i.e., the factor on hypnosis) actually is. It is both the indisputable variable and the factor most difficult to measure or control. What has not been agreed on is whether suggestibility is:

- a permanent fixed detail of character or personality:
- a genetic or chemical psychiatric tendency:
- a precursor to or symptom of an activation of such a tendency:
- a learned skill or acquired habit:
- synonymous with the function of learning:
- a neutral, unavoidable consequence of language acquisition and empathy:
- a biased terminology provoking one to resist new externally introduced ideas or perspectives:
- a mutual symbiotic relation to the Other, such as the African conception of uBunthu or Ubuntu:
- related to the capacity of empathy and communication:
- female brain / left-brain characteristics of language-interpretation and garnering negative connotations due to (disputable) gender bias from a male-dominated scientific community:
- a matter of concordant personal taste between speaker / hypnotist and listener and listener's like of / use for speaker's ideas:
- a skill or a flaw or something neutral and universal.

Existing research into the phenomena of hypnosis is extensive and randomised controlled trials predominantly support the efficacy and legitimacy of hypnotherapy, but without a clearly defined concept of the entity or aspect being studied, the level an individual is objectively "suggestible" cannot be measured empirically. It makes exact therapeutic outcomes impossible to forecast.

Moreover, it logically hinders the development of non-bespoke hypnotherapy protocol. On this latter point, it must be pointed out that while some persuasion methods are more universally effective than others, the most reliably effective method with individuals is to personalise the approach by first examining their motivational, learning, behavioural and emotional styles (et al.). Few hypnotherapists do not take a case history, or story so far, from the clients they will be working with.

Hypnosis is rarely a 'battle of wills'. Predominantly, people instinctively feel more subjectively comfortable when receiving positive suggestions in the understanding-framework we understand most easily. In practice, most people are less likely to resist the ideas for optimism or fresh perspectives if they: a) Concur with other ideas already held b) Are consistent with favorite decision-making patterns c) Flatter our self-identity to a level we accept d) Contain positive rather than negative enforcement - toward something good rather than away from something bad e) Are suggested in terms that mirror sensory combinations that person experiences the world through...making it easier for the suggestion to "make sense" - as in Neuro-linguistic programming (NLP).

Autonomy and suggestibility

The intrigue of differences in individual suggestibility even crops up in the early Greek philosophers. Aristotle had an unconcerned approach..."*The most intelligent minds are those that can entertain an idea without necessarily believing it.*"{Aristotle}

This perhaps is a more accurate echo of the experience of practicing hypnotherapists and hypnotists. When anyone is absorbed in rapt attention in someone else's inspiring words as they

outline an idea or way of thinking, the subjective attention is held because of the logic, the aesthetic, and the relevance of the words to one's own personal experience and motivations. In these natural trance states, just like those orchestrated purposefully by a hypnotherapist, your 'critical faculties' are naturally less active when there is less you would naturally be critical of. It is perhaps the "necessarily believing it" that is problematic, as this conception of suggestibility raises issues of the autonomy of attributing belief to an introduced idea, and how this happens.

Suggestibility vs. susceptibility

Popular media and layman's articles occasionally use the terms "suggestible" and "susceptible" interchangeably, with reference to the extent to which a given individual responds to incoming suggestions from another. The two terms are not synonymous however, as the latter term carries inherent negative bias absent from the neutral psychological factor described by "suggestibility."

In scientific research and academic literature on hypnosis and hypnotherapy, the term describes a neutral psychological and possibly physiological state or phenomena. This is distinct from the culturally biased common parlance of the term "suggestible." Both terms are often bound with undeserved negative social connotations not inherent in the word meanings themselves.

To be suggestible is not to be gullible. The latter pertains to an empirical objective fact that can be shown accurate or inaccurate to any observer. The former term does not. To be open to suggestion, has no bearing on the accuracy of any incoming suggestions: nor whether such an objective accuracy is possible. (As with metaphysical belief.)

Some therapists may examine worries or objections to suggestibility before proceeding with therapy: this is because some believe there is a rational or learned deliberate will to hold a belief, even in the case of more convincing new ideas, when there is a compelling cognitive reason not to 'allow oneself' to be persuaded. Perhaps this can be seen in historical cases of mass hypnosis where also there has been media suppression. In the individual, unexamined actions are sometimes described by hypno- and psycho-therapists based on outgrown belief systems.

The term "susceptible" implies weakness or some increased danger that one is more likely to become victim to and must guard against. This is supported when it is reduced to its Latin etymological origins. It therefore has a negative effect on expectation and itself is a hypnotic suggestion that suggestions must be noticed and guarded against. Hypnotic suggestions include terms, phrases, or whole concepts where to understand the concept includes making sense of a subjective sensation, or a framework for the appropriate response.... simple one-word forms of this include the word terrorism where to understand the concept, one must understand the notion of terror and then understand in the sentence that it is meant to refer to "that" given object.

Suggestibility and language acquisition

Much of the contention and concern about suggestibility as an Achilles heel in the armour of human autonomy is unfounded. Cognition of a phrase must occur before the decision how to act next can occur: because the concepts must exist before the mind. Either they are suggested from the mind itself, or in response to introduced suggestions of concepts from outside - the world and its scenarios and facts, or suggestions from other people.

A suggestion may direct the thoughts to notice a new concept, focus on a specific area within the world, offer new perspectives that later may influence action-choices, offer triggers for automatic behaviour (such as returning a smile), or indicate specific action types. In hypnotherapy the portrayed realistic experience of the client's requested outcome is suggested with flattery or urgency, as well as personalized to the client's own motivations drives and taste.

Common experience of suggestions
Suggestions are not necessarily verbal, spoken, or read. A smile, a glare, a wink, a three-piece suit, a scientist's white coat, are all suggestive devices that imply more than the immediate action. A hypnotist uses techniques that use these instinctive "fillings-in of gaps" and changes to how we respond to a scenario or moment. In the therapy setting, a hypnotist or hypnotherapist will likely evaluate these automatic cognitive leaps, or dogma, or any self-limiting or self-sabotaging beliefs.

Being under the influence of suggestion can be characterized as exhibiting behavioral compliance without private acceptance or belief. That is, actions being inconsistent with one's own volition and belief system and natural unhindered action-motivations. This could hinder the autonomy, expression or self-determination of an individual. It could equally supersede emotions with rationally chosen, deliberate long-term results.

Experimental suggestion vs. clinical suggestion
The applications of hypnosis vary widely and investigation of responses to suggestion can be usefully separated into two non-exclusive broad divisions:

- **Experimental hypnosis**: the study of "**experimental suggestion**", of the form: "*What is it that my group of test subjects actually do when I deliver the precise standard suggestion ABC to each of them in the same experimental context?*" (i.e., given a fixed suggestion, what is the outcome?)
- **Clinical hypnosis**: the study of **clinical suggestion** directed at the question: "*What is it that I can possibly say to this particular subject, in this specific context, to generate my goal of having them do XYZ?*" (I.e., given a fixed outcome, what is the suggestion?)

Many scholars and practitioners use the wider term **clinical hypnosis** to distinguish clinical hypnosis in as rigorously controlled a trial setting as possible, from **clinical hypnotherapy** (i.e., a clinical intervention in which therapy is conducted upon a hypnotized subject).

Non-state explanations of hypnotic responsiveness
According to some theoretical explanations of hypnotic responses, such as the role-playing theory of Nicholas Spanos, hypnotic subjects do not actually enter a different psychological or physiological state; but, rather, simply acting on social pressure — and, therefore, it is easier for them to comply than to disobey. Whilst this view does not dispute that hypnotized individuals truly experience the suggested effects, it asserts that the mechanism this takes place by has, in part, been "socially constructed" and does not, therefore, require any explanation involving any sort of an "altered state of consciousness".[2]

Child suggestibility
When talking about suggestibility it is important to not overlook the part of the population that is the most susceptible to influence, children. Children have an ever developing mind that is constantly being filled with new information from sources all around them. Thus, researchers have identified key factors, both internal and external, that are strong markers for suggestibility in children.

Internal

- **Age**
  Children have a remarkable ability to remember events in their lives. The real variability between ages in suggestibility is the amount of detail provided for an event. Memory detail will be great for older children. The problem as it relates to suggestibility is when children, and even adults, blend previous knowledge of similar experiences into their recollection of a

single event. Children, particularly younger children, are prone to including details that are similar yet unrelated to the specific event showing that the age of a person is critical in their susceptibility to influence.

- **Prior Knowledge**
  As mentioned before, the possession of prior knowledge that relates to an event can be particularly dangerous when dealing with child suggestibility. Prior knowledge, as it relates to suggestibility is the use of past experiences to help reconstruct past or current events. Prior knowledge of an event can actually be effective at producing accurate recall of a particular situation, but can also be equally as effective at producing false memories. Research showed that when presented with a previously familiar situation, children were likely to falsely recall events as if they had happened.
- **Gist Extraction**
  Although children are extremely likely to recall false memories when past events are similar to a current event, they will also recall false memory details that are seemingly unrelated to the event. Researchers named this phenomenon global gist, which is a representation that identifies connections across multiple events. Children will falsely recall information that fits with their representation of the events around them.

External

- **Interviewer Bias**
  Interviewer Bias is the opinion or prejudice on the part of an interviewer, which is displayed during the interview process and thus affects the outcome of the interview. This happens when interviewers pursue only a single hypothesis that supports what they already think, and ignore any details that counter their hypothesis. The goal is not to get the truth, but simply corroborate what is already believed, and some believe this to be a necessary way of extracting information from children.
- **Repeated Questions**
  It has been shown that asking children the same question over and over again in an interview will often cause the child to reverse their first answer, especially in yes or no questions. It is the child's belief that since the question is being repeated that they must have not answered correctly and need to change their answer.
- **Interviewer's Tone**
  Children are extremely perceptive of people's tones, especially in an interview situation. When an interviewer's tone dictates the questioning, a child is likely to construct memories of past events when they actually have no memory of that event. An example would be that when a positive tone is used, it has shown to produce more detailed and accurate accounts of events. Conversely, it has also been shown to have the opposite effect and produce just a lot of false information to appease the interviewer.
- **Peer Interactions**
  Children's accounts of events can be greatly distorted by information from their peers. In some cases, children who were not present at the time of an event will recall being at the event, and details of the events. This information most likely has come from their peers. These children also most likely speak up just so not to feel left out.
- **Repeating Misinformation**
  Repeating misinformation is simply when an interviewer gives a child incorrect details of an event. This technique is used over several interviews and occurs several times within a single interview. It has been shown to have a great effect on the accuracy of a child's recollection of an event, and eventually, the misinformation will be included in the child's account of a given event.

Other cases of suggestibility

It is claimed that sufferers of Posttraumatic Stress Disorder and Dissociative Identity Disorder (DID) are particularly suggestible. While it is true that DID sufferers tend to score to the higher end of the hypnotizability scale, there have not been enough studies done to support the claim of increased suggestibility.

Aspects of crowd dynamics and mob behaviour, as well as the phenomenon of groupthink are further examples of suggestibility. Common examples of suggestible behavior in everyday life include "contagious yawning" (multiple people begin to yawn after observing a person yawning) and the medical student syndrome (a person begins to experience symptoms of an illness after reading or hearing about it). Placebo response is also thought to be based on individual differences in suggestibility, at least in part. Suggestible persons may be more responsive to various forms of alternative health practices that seem to rely upon patient belief in the intervention more than on any known mechanism. Studies of effects of health interventions can be enhanced by controlling for individual differences in suggestibility. A search of the *Mental Measurements Yearbook* shows no extant psychological test for this personality characteristic. The Gudjonsson suggestibility scale is questionable for this kind of purpose due to its narrow focus. However, see the [1] (MISS) for a recently developed self-report scale. In addition to health-related implications, persons who are highly suggestible may be prone to making poor judgments because they did not process suggestions critically and falling prey to emotion-based advertising.

Notes

1. Subjects participating in hypnotic experiments commonly report that their overt responses to test-suggestions occurred without their active volition. For example, when given a suggestion for arm levitation, hypnotic subjects typically state that the arm rose by itself – they did not feel that they made the arm rise.[2]:510

References

1. Wagstaff, Graham F. (1991). "Suggestibility: A social psychological approach". *Human suggestibility: Advances in theory, research, and application*. Florence, Kentucky: Taylor & Frances/Routledge. p.141
2. Spanos, Nicholas P.; Barber, Theodore X. (1972). "Cognitive activity during 'hypnotic' suggestibility: Goal-directed fantasy and the experience of nonvolition1". *Journal of Personality* **40** (3): 510–524.
3. http://www.stonybrookmedicalcenter.org/psychiatry/kotov_r

Further reading

- Aveling, F. & Hargreaves, H.L., "Suggestibility With And Without Prestige In Children", *British Journal of Psychology*, Vol.12, No.1, (June 1921), pp.53–75.
- Barber, T.X., "Comparison of Suggestibility during "Light Sleep" and Hypnosis", *Science*, Vol.124, No.3218, (31 August 1956), p.405.
- Benton, A.L. & Bandura, A., ""Primary" and "Secondary" Suggestibility", *Journal of Abnormal and Social Psychology*, Vol.48, No.3, (1953), pp.336–340.
- Binet, A., "La Suggestibilité", 1900.
- Bird, C., "Suggestion and Suggestibility: A Bibliography", *Psychological Bulletin*, Vol.36, No.4, (April 1939), pp.264–283.
- Braffman, W. & Kirsch, I., "Imaginative Suggestibility and Hypnotizability: An Empirical Analysis", *Journal of Personality and Social Psychology*, Vol.77, No.3, (September 1999), pp.578–587.

- Brown, W., "Hypnosis, Suggestibility and Progressive Relaxation", *British Journal of Psychology*, Vol.28, No.4, (April 1938), pp.396–411.
- Coffin, T.E., "Some Conditions of Suggestion and Suggestibility: A Study of Certain Attitudinal and Situational Factors Influencing the Process of Suggestion", *Psychological Monographs*, Vol.53, No.4, (1941).
- Davis, S.L., "Social and Scientific Influences on the Study of Children's Suggestibility: A Historical Perspective", *Child Maltreatment*, Vol.3, No.2, (May 1998), pp.186–194
- De Pascalis, V., Ray, W.J., Tranquillo, I. & D'Amico, D., "EEG Activity and Heart Rate During Recall of Emotional Events in Hypnosis: Relationships with Hypnotizability and Suggestibility", *International Journal of Psychophysiology*, Vol.29, No.3, (1 August 1998), pp.255–275.
- Eisen, M.L., "The Relationship Between Memory, Suggestibility and Hypnotic Responsivity", *American Journal of Clinical Hypnosis*, Vol.39, No.2, (October 1996), pp.126–137.
- Evans, F.J., "Suggestibility in the Normal Waking State", *Psychological Bulletin*, Vol.67, No.2, (February 1967), pp.114–129.
- Gheorghiu, V.A., Netter, P., Eysenck, H.J., Rosenthal, R., Fiedler, K., Edmonston, W.E., Lundy, R.M. & Sheehan, P.W. (eds.), *Suggestion and Suggestibility: Theory and Research: Proceedings of the First International Symposium on Suggestion and Suggestibility, held at the University of Giessen, 1987*, Springer-Verlag, (Berlin), 1989.
- Hergovich, A., "Field Dependence, Suggestibility and Belief in Paranormal Phenomena", *Personality and Individual Differences*, Vol.34, No.2, (February 2003), pp.195–209.
- Hergovich, A., "The Effect of Pseudo-Psychic Demonstrations as Dependent on Belief in Paranormal Phenomena and Suggestibility", *Personality and Individual Differences*, Vol.36, No.2, (January 2004), pp. 365–380.
- Hilgard, E.R. & Hilgard, J.R., *Hypnotic Susceptibility*, Harcourt, Brace & World, (New York), 1965.
- Hull, C.L., *Hypnosis and Suggestibility: An Experimental Approach*, Appleton-Century-Crofts, (New York), 1933.
- Janet, P., "The Hysterical Stigmata — Suggestibility", pp.270–292 in Janet, P., *The Major Symptoms of Hysteria*, Macmillan Publishing, (New York), 1907.
- Janet, P., "The Hysterical Stigmata — The Contraction of the Field of Consciousness — The Common Stigmata", pp.293–316 in Janet, P., *The Major Symptoms of Hysteria*, Macmillan Publishing, (New York), 1907.
- Janis, I., "Personality Correlates of Susceptibility To Persuasion", *Journal of Personality*, Vol.22, No.4, (June 1954), pp.504–518.
- Kirsch, I., "Changing Expectations: A Key to Effective Psychotherapy", Brookes/Cole, (California), 1990.
- Kirsch, I. & Braffman, W., "Imaginative Suggestibility and Hypnotizability", *Current Directions in Psychological Science*, Vol.10, No.2, (April 2001), pp.57–61.
- Lynn, S.J., "Enhancing Suggestibility: The Effects of Compliance vs. Imagery", *American Journal of Clinical Hypnosis*, Vol.47, No.2, (October 2004), pp.117–128.
- Lynn, S.J., Shindler, K. & Meyer, E., "Hypnotic Suggestibility, Psychopathology, and Treatment Outcome", Sleep and Hypnosis, Vol.5, No.1, (2003), pp.2–10.
- Matheus, J.M., "Effects on Suggestibility of Experimenter Prestige Under Hypnotic Induction Conditions", *American Journal of Clinical Hypnosis*, Vol.15, No.3, (January 1973), pp.199–208.
- Meares, A., "On The Nature Of Suggestibility", *British Journal of Medical Hypnotism*, (Summer 1956), pp.3–8.

- Meares, A., "The Clinical Estimation of Suggestibility", *Journal of Clinical and Experimental Hypnosis*, Vol. II, No.2, (April 1954), pp.106–108.
- Neal, E.V. & Clark, C.S. (eds), *Hypnotism and Hypnotic Suggestion: A Scientific Treatise on the Uses and Possibilities of Hypnotism, Suggestion and Allied Phenomena by Thirty Authors*, New York State Publishing Co., (Rochester), 1900.
- Poulsen, B.C. & Matthews, W.J., "Correlates of Imaginative and Hypnotic Suggestibility in Children", *Contemporary Hypnosis*, Vol.20, No.4, (2003), pp.198–208.
- Powell, M.B. & Roberts, K.P., "The Effect of Repeated Experience on Children's Suggestibility Across Two Question Types", *Applied Cognitive Psychology*, Vol.16, No.4, (May 2002), pp.367–386.
- Prideaux, E., "Suggestion and Suggestibility", *Brain*, Vol.42, (January 1920), pp.291–304.
- Scheier, M.F., Carver, C.S. & Gibbons, F.X., "Self-Directed Attention, Awareness of Bodily States, and Suggestibility", *Journal of Personality and Social Psychology*, Vol.37, No.9, (1979), pp.1576–1588.
- Shumaker, J.F. (ed), *Human Suggestibility: Advances in Theory, Research, and Application*, Routledge, (New York), 1991.
- Sidis, B., *The Psychology of Suggestion: A Research into the Subconscious Nature of Man and Society*, D. Appleton & Company, (New York), 1898.
- Solomon, J., "Hypnotism, Suggestibility and the Law", *Nebraska Law Review*, Vol.31, No.4, (May 1952), pp.575–596.
- Wegrocki, H.J., "The Effect of Prestige Suggestibility on Emotional Attitudes", *Journal of Social Psychology*, Vol.5, (1934), pp.384–394.
- Weitzenhoffer, A.M., *Hypnotism: An Objective Study in Suggestibility*, John Wiley & Sons, (New York), 1953.
- White, R., "Influence of Suggestibility on Responses in Ink Spot Test", *Child Development*, Vol.2, No.1, (March 1931), pp.76–79.
- Wilson, I., *The Bleeding Mind: An Investigation into the Mysterious Phenomenon of Stigmata*, Paladin, (London), 1991.

TOPIC: Eyewitness Memory

The following text borrows extensively from Wikipedia, which offers a readable synopsis of ***eyewitness memory***.

An **eyewitness memory** is a person's episodic memory for a crime or other dramatic event that he or she has witnessed.[1] Eyewitness testimony is often relied upon in the judicial system. However, the accuracy of eyewitness memories is sometimes questioned because there are many factors that can act during encoding and retrieval of the witnessed event which may adversely affect the creation and maintenance of the memory for the event. Experts have found evidence to suggest that eyewitness memory is volatile.[1] It has long been speculated that mistaken eyewitness identification plays a major role in the wrongful conviction of innocent individuals. A growing body of research now supports this speculation, indicating that mistaken eyewitness identification is responsible for more convictions of the innocent than all other factors combined.[2][3][4] The Innocence Project determined that 75% of the 239 DNA exoneration cases had occurred due to inaccurate eyewitness testimony. It is important to inform the public about the flawed nature of eyewitness memory and the difficulties relating to its use in the criminal justice system so that eyewitness accounts are not viewed as the absolute truth.[5]

Retrieval]

Lineups:

A police lineup is a method for an eyewitness to identify a perpetrator by viewing a series of photos, or a live group of suspects.[19] One possible outcome of a lineup is that the eyewitness can correctly identify the criminal. Another outcome is that the eyewitness can correctly state that the criminal is not in the lineup. A third option is that the eyewitness can fail to recognize that the culprit is present. Lastly, the eyewitness can incorrectly select another suspect. The ideal result is to correctly identify the offender, and the worst outcome is to mistakenly identify an innocent.[19]

Police Role in Lineup

There are specific guidelines for police to follow when administering a lineup, to reduce bias in the lineup and increase the accuracy of eyewitness judgments.[19] Police must reduce the pressure that eyewitnesses feel to select a criminal from an array of photos or persons. They should make sure that the eyewitness is aware that the perpetrator might not be in the lineup. Also, police should conduct a double blind procedure that does not allow them to see the lineup. This prevents police from giving the eyewitness any information, intentional or not, about who in the lineup is a police suspect. It also prevents the police from giving any feedback to the eyewitness. Feedback can produce a false confidence in the witness' selection. When overseeing a lineup, the police can use speed of recognition to determine the validity of the identification. If the witness quickly identifies the perpetrator, then the selection is more likely to be correct.[19]

Style of Lineup

A sequential lineup presents a witness with a series of photos one at a time, requiring the participant to identify if each photo matches his/her memory before moving forward.[29] The witness does not know how many photos are in the group. In a simultaneous lineup, the photos or suspects are viewed together. Sequential lineups produce fewer identifications, since they are more challenging, and require absolute judgment. This means that the decision regarding the matching of the memory to the photo is independently made. On the other hand, a simultaneous lineup requires relative judgment, as the decision is not independent of the other possibilities. Police tend to use simultaneous lineups because they result in more correct identifications, although recently researchers have urged police to use sequential lineups as they result in less

incorrect identifications.[29] When a second lap of the suspects (a repeated viewing of a sequential lineup) is shown, more errors occur than when a single lap is shown. If a second lap is required, there are fewer errors than if the lap is chosen by a participant.[29]

Size of Lineup

Lineup members should have diverse characteristics so that lineups are not biased toward or against the suspect. If the appearance of a person stands out amongst the otherwise indistinctive crowd then an eyewitness is more likely to select that person regardless of their own recollection of the criminal. Thus, this line up is suggestive.[30] Fillers should be added to the lineup in order to depict a broad spectrum of characteristics,[31] but must match any known description of the offender. If lineup members do not all match the known description of the offender then the lineup is biased toward the suspect.[32] Biased lineups have been shown to increase misidentifications, particularly in target-absent lineups.[33] Increasing the nominal size of a lineup (the actual number of suspects that are compiled) often decreases the potential for a wrong selection. Functional size also plays a role in lineup bias. Functional size is the reciprocal of the fraction of mock witnesses that choose the suspect from a lineup.[34] For example, in a lineup of nominal size 5, if 15 out of 30 mock witnesses (randomly chosen individuals that did not experience the offence) choose the suspect, the functional size of the lineup is the reciprocal of 15/30, which is 30/15, or 2. So although the lineup has 5 members, functionally it only has 2. Effective size is the number of probable suspects. Police use these three numbers to evaluate a lineup.[31]

Viewpoints

Many studies, as well as police procedures, are dependent on photo lineups or police lineups where the eyewitness views the suspects from a distance. This procedure is done in an attempt to eliminate suspects and identify the perpetrator. These types of lineups allow only small degrees of visual information for the eyewitness, such as limited viewing angles, which restrict the level of detail compared to a computerized virtual lineup where witnesses can see the targets from multiple angles and distances. One might anticipate that examination of the suspects from unlimited viewpoints would allow for better recognition cues, than when compared to limited views. However, unlimited visual information may be disadvantageous and counterproductive if the information offered at the time of retrieval was not actually present at the time of memory encoding.[35] For example, if an eyewitness only saw the face of the perpetrator from one angle, seeing the lineup participants from other viewpoints might be distracting. Other studies have demonstrated that unlimited viewpoints do improve accuracy in police lineups.[35] It should also be noted that the eyewitness accuracy improves when the distance between the suspect and witness matches the distance during the initial witnessing of the crime.[36]

Retroactive Interference

Another phenomenon that may interfere with an eyewitness' memory is retroactive interference. This occurs when new information is processed that obstructs the retrieval of old information.[37] A common source of interference that may occur after the event of a crime is the reporting of the crime. Police investigations include questioning that is often suggestive. The processing of new information may disrupt or entirely replace old information.[38] If a police officer has reason to believe that a suspect is guilty the interrogator's bias can influence the eyewitness' memory. The interrogators can also put pressure on witnesses causing them to want to select a perpetrator from a police lineup. Eyewitnesses are often unsuspecting of the interrogator bias and believe their memories to be uncontaminated.[39]

Co-witness Contamination

The presence of a co-witness can often contaminate memories.[40] When witnesses confer about an event they can end up agreeing on an incorrect narrative. Research has found that 71% of witnesses changed their eyewitness accounts to include false components that their co-witnesses

remembered.[41] This makes it very difficult to reconstruct the actual account of an event. To prevent this effect, police should separate witnesses as early as possible before the reporting of the event. Unfortunately this is difficult, especially if the police do not get involved immediately after the event. Police should inform witnesses of the possibility of contamination as soon as possible. Witnesses should be interviewed as soon as possible with police noting if the witnesses have compared accounts. Once the accounts have been recorded, police should make notes of similarities or differences that could point to contaminated details or facts. [42]

Confidence

A witness identifying a suspect can make a decision with little or great confidence. Level of confidence varies between different witnesses and situations. There are two types of confidence: confidence in a witness' own ability to make an identification (prior to viewing a police lineup) and confidence in having made an accurate identification or accurate rejection.

The witness' confidence in his/her ability to make a correct identification should not be used to assess the accuracy of identification. Witnesses should be asked to attempt identifications even if their confidence is low. Confidence ratings after identification of a suspect is a better (but not perfect) predictor.[43]

In many experiments, witnesses are asked to rate their confidence in their decision after making an identification from a lineup. Witnesses that are confident in their identifications are only slightly more likely to be correct when compared to witnesses who exhibit little confidence in their decision.[43] A number of psychologists have investigated factors that might affect the confidence accuracy relationship.

The optimality hypothesis states that factors influencing the optimality of information processing also influence the reliability of the confidence estimate. During situations in which information processing conditions are less than optimal (e.g. the perpetrator is disguised or duration of exposure is brief) witnesses' performance during identification decreases and they are less confident in their decision. The confidence accuracy correlation is thus estimated to be stronger in situations of optimal information processing such as longer exposure time, and weaker under conditions that that are not optimal.[44]

Certain factors affect identification accuracy without influencing confidence whereas other factors influence confidence without having an effect on identification accuracy. Reconstructive processes in memory (i.e. the influence of post-event information on stored memories) can influence identification accuracy while not necessarily affecting confidence. Social influence processes (i.e. committing to a decision) might have an effect on confidence judgments while having little to no effect on the accuracy of the identification.[45]

It is commonly assumed that the confidence of an eyewitness when identifying a suspect is important for accuracy of identification but this is not the case. Accuracy in identification depends on the circumstances surrounding the identification as well as the factors discussed above. The confidence of a witness during identification is generally a weak predictor of identification accuracy, as is the quality of descriptions and the consistency between descriptions.[45] These factors should not be taken into account when choosing whether or not to conduct a police lineup. When evaluating identification evidence, greater attention should be paid to the circumstances surrounding the identification as the confidence of the eyewitness is less important.

Interviews

The method of conducting an interview has great implication on the accuracy of the testimony. When the person being interviewed is forced to provide more information, he/she is more likely

to engage in confabulation.[46] For example, when participants were shown a video and instructed to answer all questions (answerable and unanswerable) about its content, they often fabricated information.[46] Hypnosis is not an effective technique for retrieving inaccessible information because the amount of information reported would increase along with the amount of confabulation, possibly resulting in a false testimony.[19]

Cognitive Interview Technique

Researchers have developed a strategy, entitled the **cognitive interview** technique, to elicit the most accurate eyewitness memory.[47] In this preferred protocol for conducting interviews, the interrogator should make the witness feel comfortable, ask open-ended questions, and grant the witness freedom in describing the event.[19] In addition, the interviewer should encourage the witness to exhaust his/her memory by reinstating the context of the event, recalling the events in different orders, and viewing the event scene from different perspectives.[19]

Suggestibility

Distortions in a witness's memory can be induced by suggestive questioning procedures.[48] Asking eyewitnesses to repeatedly retrieve information in multiple interviews may enhance memory because the event is being rehearsed many times or, as in many cases, increase suggestibility. Misleading information offered by the investigators may attract more attention than the originally-encoded information, so the witness' memory of the event is altered to include erroneous details suggested during the interview.[48] In addition, repeating questions could make the witness feel pressured to change his or her answer or elaborate on an already-given response with fabricated details.[49] Open-ended questioning can reduce the level of retrieval-enhanced suggestibility because the witness is not subjected to testing manipulation by the interviewer.[48]

Contextual Reinstatement

Contextual reinstatement is a common technique used to help eyewitnesses remember details about a specific environment– reviewing the initial environment in which the original information was encoded. Taking a witness back to the scene where the event occurred, for example, will help facilitate the accuracy in identifying perpetrators. Reinstatement is thought to improve recall as it provides memory retrieval cues. Research has demonstrated that pairing faces of suspects or words with contextual cues at the scene of the crime will enhance performance on recognition tasks.[50][51] Therefore, it seems practical that these results can be applied to eyewitness identification. Methods commonly used to examine context reinstatement include photographs of the environment/scene, mental contextual reinstatement cues, and guided recollection. Studies show that re-exposing participants to the crime scene does enhance performance in facial recognition.[52] There were also notable effects for context reinstatement where improvement on correct identifications while increasing false alarms. Reports also show that the magnitude of improvement via context reinstatement increased in lifelike situations compared to laboratory studies.[39]

Experimental Context

An alteration of context was found to be one of the most important predictors of recognition accuracy. Such changes in experimental context have been shown to have effects similar to transformations in appearance, such as disguises. Criminal identifications can be influenced by a change in context. Investigators must account for the fact that encountering an acquaintance that we usually see in one context, such as work place, alters memory generalizability when compared to encountering the same acquaintance in another environment that acts like an unassociated context, such as a grocery store. The changes in environment make it difficult to identify this acquaintance.[39] Initially, the individual might seem familiar but because this person is not in the normal context, it might be difficult to place the face and recall the name.

Researchers have begun to implement procedures for reinstating the context surrounding a specific event in an attempt to improve identification accuracy. Reinstating the crime scene is often not possible. Sometimes, however it is possible to have eyewitnesses imagine and thus mentally reinstate the surroundings with imagery instructions and other mnemonic devices.[39] In some instances, objects from the crime scene such as guns or clothing can be used additionally to help reinstate the context. Such methods have successfully shown to improve reliability and accuracy of eyewitness recall.

Child Testimony

Children's testimony refers to when children are required to testify in court after witnessing or being involved in a crime. In situations where a child is the main witness of a crime, the result of the hearing is dependent on the child's memory of the event. And there are several important issues associated with eyewitness memory of children. For example, the accuracy of the child's explanation, in such situations, coupled with how well the child can identify the setting of the crime and the individuals involved in the crime, influence the credibility of the child's testimony. Sometimes, children can correctly report details of a crime they witnessed or experienced and can identify those responsible, but child eyewitnesses can also create false memories.[53]

Like all eyewitnesses, child eyewitnesses are subject to memory errors. However, a child victim or eyewitness poses additional challenges to law enforcement because children often have a limited vocabulary, a desire to please the officer, or difficulty answering questions because of trauma.[53] Using early childhood memories in eyewitness testimony can also be challenging because for the first 1–2 years of life, brain structures such as the limbic system, which holds the hippocampus and the amygdala and is involved in memory storage,[54] are not yet fully developed.[55] Research has demonstrated that children can remember events from before the age of 3–4 years, but that these memories decline as children get older.[56][57]

Children can be involved in testimony not only when they are witnesses, but also when they are victims. Due to the sensitivity of these cases, strategic interviewing is implemented for children, which may result in the validity of the memory to suffer. Strategic interviewing must be assessed with sensitivity on an individual bases and without leading questions, as they may influence the child's answer.[58] Additional influences may include individuals surrounding the child prior to, and during the hearing. If children hear new information from such individuals, studies show that children will more than likely agree with what the others said – regardless of the child's initial opinion.[59]

Studies on children show that the average child is at greater risk for memory loss, due to the brain's immaturity and plasticity, when compared to an average adult.[18] Poorer memory performance in young kids was shown when youth of different ages were asked to recall a doctor's visit.[14] Children aged 3–5 answered with much less accuracy than individuals aged 6–15, indicating developmental differences in memory capacity. However, children often demonstrate high accuracy in remembering events that are personally meaningful, such as genital contact, which is prevalent in cases of sexual assault.[14] Furthermore, it has been shown that information encoded and stored in memory is dependent on the extent of knowledge regarding the event. That is, if a child is exposed to an event that he or she knows little about, their memory of the event will not be as accurate when compared to a child who is more knowledgeable on event-related topics.[60] These results of increased sensitivity, suggestibility and memory loss in children lead one to question the competency of a child to serve as an eyewitness. Researchers have determined that a child should be considered a competent witness if he or she has the capacity to observe, communicate, produce sufficient memories, differentiate truth from lies, and understand the obligation to tell the truth.[14]

Intellectual Ability and Testimony

Individuals with intellectual disabilities are at a higher risk for sexual abuse and exploitation because they are often dependent on others and uneducated or physically incompetent in ways of self-protection.[61] Therefore, much research has been devoted to investigating the accountability of these individuals in eyewitness testimonies. When a group of adults chosen by the Developmental Disabilities Association was compared to a control group of college students, they performed equally well when a target was absent from a lineup. However, the control group were better at recognizing when a target was present in a lineup, leading to the determination that people with intellectual disabilities are more suggestible and likely to confabulate.[61] Children with intellectual disabilities show similar patterns in their eyewitness accounts. After watching a video of a crime, children with these disabilities performed worse than non-disabled kids of the same age on free recall, open-ended questions, and both general and specific misleading questions.[62] These children performed better than the age-matched control group only on leading questions with yes or no answers, suggesting that they are more likely to acquiesce in the interview.[62] These findings indicate that individuals with intellectual disabilities could be considered competent witnesses if interrogated in a non-leading manner.

Photographic Memory (Eidetic Memory)

Perception and knowledge of the world stem and expand from the selection and integration of stimuli hitting our sensory receptors.[63] As a result, the most precise visual memories possible could only be the images that created the initial visual integration and not the stimulus array itself. Individuals who are said to possess eidetic memories, may be of particular use in courtrooms when acting as an eyewitness, as they have the ability to hold to an image in mind for longer and with more accuracy than the average individual.[64] This would be particularly useful at the time of a crime to retain images such as the perpetrator's face, clothes, license plate, etc. These mental photographs may be comparable to presenting a real tangible photograph of the event witnessed. **However, the memories of those who claim to have superior photographic memories are just as flawed as the memories of individuals who have normal mnemonic abilities**.[65] This would affect the validity of testimonies from witnesses with photographic memories. Witnesses who believe that they are able to retrieve an accurate mental photograph will be much more confident in their account of the event and may influence the trial outcome.[64] Accuracy recall of such visual scenes is a controversial issue. In the past, eidetikers were believed to have extremely accurate recall for visual displays, but modern research findings might reveal a different story. Some research demonstrates that eidetic children have greater recall accuracy for visual details compared to non-eidetic children. Other researchers have failed to find any advantage between the two groups. It is also hypothesized that eidetic imagery is not exactly related to memory and improves recall for visual details. If this is true, photographic memory is not particularly useful in the courtroom, which could explain the general failure to detect its existence in adults.[63] Eidetikers cannot produce images of each and every sensory experience on demand. Alternatively, images are created only if the stimulus contains interesting material and a coherent structure. This characteristic critically reduces possible application to criminal justice. Even though there are various thoughts and ideas regarding photographic memory, some people do have exceptional memories, which will help improve the accuracy of eyewitness identification.

The frequency of eidetic imagery is low in adults and shows greatest frequency in early child development. In fact, it is almost non-existent past the age of 7. When procedures are used to classify eidetic memory separate from the characteristic of afterimage and memory image, a small number of children are classified as true eidetikers.

Forensic Expert

One method that has become more and more prevalent to reduce negative consequences that can stem from errors in eyewitness testimony, including errors that can arise from weapon focus effect, is expert witness testimonies by research psychologists about eyewitness testimony. This is an educational session, which a judge has to allow, given by a forensic psychologist to a jury as part of the trial. This form of expert testimony has been called social framework testimony, defined by Cronin as "*expert testimony that presents conclusions based on social science research to assist the court in making a decision*." The expert testimony would provide the jury with a context for evaluating eyewitness testimonies and the jury is meant to factor that into its decision making process. These educational sessions in the courtroom will help make the presentation of eyewitness testimony as rigorous as process and put as much scrutiny on the social evidence as what is put on physical, scientific evidence. Eyewitness testimony is very often wrong, and the scrutiny put on it greatly reduces the number of false convictions.

The major problem with this strategy is that many judges do not allow this expert testimony in their courts. Their reasoning is usually that they think what the social framework testimony will present is common knowledge. However, the data overwhelmingly shows that the typical jury member does not know most of the information presented by the expert. The fallibility of eyewitness testimony is not common knowledge and eyewitness psychology can offer valid and constructive information to juries. Even with this knowledge, jury decisions cannot perfectly serve justice without exceptions but perfection in the legal system is an unattainable goal. However, any information the can be presented about the shortcomings of eyewitness testimony can better serve justice in the long run.

There can be some ethical concerns to these expert witnesses. There are arguments that suggest that these social framework testimonies serve to discredit the eyewitnesses and put the victims and bystanders on trial. This is not the purpose of the experts though. These testimonies are merely attempting to educate jury members of problems that can arise from eyewitnesses. There can also be issues raised about the credibility of the expert testimonies. The screening process of the experts is not very stringent and the criteria of an expert witness are not laid out in black in white. This can lead to a battle of the experts between prosecution and defense. Any testimony the prosecution of defense deems relevant to contradict the opposing side, and if the judge allows it, an expert can be called and a battle of the experts can ensue. This takes away from the central point of a trial and can overwhelm the jury. This can also perpetuate the stereotype of a ruthless lawyer type.

References

1. Loftus, E. F. (1980). Impact of expert psychological testimony on the unreliability of eyewitness identification. *Journal of Applied Psychology*, 65(1): 9-15.
2. Wells, G.L., & Bradfield, A.L. (1998). "Good, you identified the suspect": Feedback to eyewitnesses distorts their reports of the witnessing experience. *Journal of Applied Psychology*, 83(3): 360-376.
3. Scheck, B., Neufeld, P., & Dwyer, J. (2000). *Actual Innocence*. New York, NY: Random House.
4. Haber, R. N., Haber, L. (2000). Experiencing, remembering and reporting events. *Psychology, Public Policy, and Law*, 6(4): 1057-1097.
5. Ask, K., & Granhag, P.A. (2010). Perception of line-up suggestiveness: Effects of identification outcome knowledge. *Journal of Investigative Psychology and Offender Profiling*, 7(3): 214–230.
6. Megreya, A. M., & Burton, A. M. (2008). Matching faces to photographs: Poor performance in eyewitness memory (without the memory). *Journal of Experimental Psychology: Applied*, 14(4): 364–372.
7. Bruce, V., Henderson, Z., Greenwood, K., Hancock, P. J. B., Burton, A. M., Miller, P. (1999). Verification of face identities from images captured on video. *Journal of Experimental Psychology: Applied, 5*(4): 339-360
8. Kanwisher, N., & Yovel, G. (2006). The fusiform face area: A cortical region specialized for the perception of faces. *Philosophical Transactions of The Royal Society, 361*: 2109-2128.

9. Wells, G. L., & Hasel, L. E. (2007). Facial composite production by eyewitnesses. *Current Directions in Psychological Science, 16*(1): 6-10.
10. Shriver, E. R., Young, S. G., Hugenberg, K., Bernstein, M. J., & Lanter, J. R. (2008). Class, race, and the face: Social context modulates the cross-race effect in face recognition. *Personality and Social Psychology Bulletin, 34*(2): 260-274.
11. Herzmann, G., Willenbockel, V., Tanaka, J. W., & Curran, T. (2011). The neural correlates of memory encoding and recognition for own-race and other-race faces. *Neuropsychologia, 49*(11): 3103-3115.
12. Brigham, J. C., Bennett, L. B., Meissner, C. A., & Mitchell, T. L. (2007). The Influence of Race on Eyewitness Memory. In R.C.L. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *The Handbook of Eyewitness Psychology: Memory for People* (pp. 257–281). Mahwah, NJ: Lawrence Erlbaum Associates.
13. Pauker, K., & Ambady, N. (2009). Multiracial faces: How categorization affects memory at the boundaries of race. *Journal of Social Issues, 65*(1): 69-86.
14. Jianjian Qin; Jodi A. Quas, Allison D. Redlich, Gail S. Goodman (1997). "Children's Eyewitness Testimony: Memory development in the legal context". In Nelson Cowan, Charles Hulme. *The Development of Memory in Childhood*. UK: Psychology Press. pp.301–341.
15. Amir, N., Leiner, A. S., & Bomyea, J. (2010). Implicit memory and posttraumatic stress symptoms. *Cognitive Therapy & Research*, 34, 49 – 58.
16. Pujol, M. & Kopelman, M. D. (2003). Psychogenic Amnesia. *Practical Neurology, 3*, 292 – 299.
17. Pyszora, N. M., Barker, A. F., & Kopelman, M. D. (2003) Amnesia for criminal offenses: A study of life sentence prisoners. *The Journal of Forensic Psychiatry and Psychology, 14*, 475 – 490.
18. Joseph, R. (1998). Traumatic amnesia, repression, and hippocampus injury due to emotional stress, corticosteroids, and enkephalins. *Child Psychiatry and Human Development, 29*(2), 169 – 179.
19. Robinson-Riegler, Bridget (2012). *Cognitive Psychology: Applying the Science of the Mind, 3rd Edition*. Boston, MA: Pearson Education, Inc. pp. 305–322.
20. Hope, Lorraine; Daniel Wright (November 2007). "Beyond unusual? Examining the role of attention in the weapon focus effect". *Applied Cognitive Psychology* **21** (7): 951–961.
21. Kerri L. Pickel (2007). "Remembering and Identifying Menacing Perpetrators: Exposure to Violence and the Weapon Focus Effect". In R.C.L. Lindsay, David F. Ross, J. Don Read, Michael P. Toglia. *The Handbook of Eyewitness Psychology: Memory for People*. Mahwah, New Jersey: Lawrence Erlbaum Associates. pp.339–360.
22. Anderson, M. C., Bjork, R. A., & Bjork, E. L. (1994). Remembering can cause forgetting: Retrieval dynamics in long-term memory. *Journal of Experimental Psychology, 20*(5), 1063–1063.
23. Loftus, E., F. (1979). Malleability of human memory. *American Scientist, 67*(3):312-320
24. Echterhoff, G., Hirst, W., Hussy, W. (2005). How eyewitnesses resist misinformation: Social postwarnings and the monitoring of memory characteristics. *Memory & Cognition, 33*(5): 770-782.
25. Eakin, D. K., Schreiber, T. A., Sergent-Marshall, S. (2003). Misinformation effect in eyewitness memory: The presence and absence of memory impairment as a function of warning and misinformation accessibility. *Journal of Experimental Psychology, 29*(5): 813-825.
26. Roediger III J, H. L., Jacoby, D., McDermott, K. B. (1996). Misinformation effects in recall: creating false memories through repeated retrieval. *Journal of Memory and Language, 35*(2): 300-318.
27. Davis, Deborah; Elizabeth F. Loftus, Samuel Vanous, Michael Cucciare (July 2008). "'Unconscious transference' can be an instance of change blindness". *Applied Cognitive Psychology* **22** (5): 605–623.
28. Brewer, Neil; Gary L. Wells (February 2011). "Eyewitness identification". *Current Directions in Psychological Science* **20** (1): 24–27.
29. Steblay, N, & Dysart, J. (2003). Eyewitness accuracy rates in sequential and simultaneous lineup presentations: a meta-analytic comparison. *Law and Human Behavior, 25*(5), 459-473.
30. Ask, Karl; Par Anders Granhag (October 2010). "Perception of Line-up Suggestiveness: Effects of Identification Oucome Knowledge". *Journal of Investigative Psychology and Offender Profiling* **7** (3): 213–229.
31. Roy S. Malpass; Colin G. Tredoux, Dawn McQuiston-Surrett (2007). "Lineup Construction and Lineup Fairness". In R.C.L. Lindsay, David F. Ross, J. Don Read, Michael P. Toglia. *The Handbook of Eyewitness Psychology: Memory for People*. Mahwah, New Jersey: Lawrence Erlbaum Associates. pp.155–178.
32. Luus, C. A. E., & Wells, G. L. (1991). Eyewitness identification and the selection of distracters for lineups. *Law and Human Behavior*, 15, 43-57.
33. Malpass, R.S. & Devine, P.G. (1981). Eyewitness identification: Lineup instructions and the absence of the offender. Journal of Applied Psychology, 66 (4), 482-489.
34. Wells, G. L., Leippe, M. R., & Ostrom, T. M. (1979). Guidelines for empirically assessing the fairness of a lineup. *Law and Human Behavior*, 3 (4), 285-293.

35. Bailenson, J, & Davies , A. (2008). The effects of witness viewpoint distance, angle, and choice on eyewitness accuracy in police lineups conducted in immersive virtual environments. *PRESENCE*, 17(3), 242-255.
36. Lindsay, R, & Semmler, C. (2008). How variations in distance affect eyewitness reports and identification accuracy. *Law Hum Behavior*, 32, 526–535.
37. Barnes, J. M., & Underwood, B.J. (1959). Fate of first-list association in transfer theory. *Journal of Experimental Psychology, 58*(2), 97 – 105.
38. Chan, J. C. K., Thomas, A. K., & Bulevich, J. B. (2009). Recalling a witness increases eyewitness suggestibility. *Association of Psychological Science, 20*(1), 66 – 72.
39. Smith, Johnathon E.; Robert J. Pleban, David R. Shaffer (February 1982). "Effects of Interrogator Bias and a Police Trait Questionnaire on the Accuracy of Eyewitness Identification". *The Journal of Social Psychology* **116**: 19–26.
40. Christian A. Meissner; Siegfried L. Sporer, Jonathon W. Schooler (2007). "Person Descriptions as Eyewitness Evidence". In R.C.L. Lindsay, David F. Ross, J. Don Read, Michael P. Toglia. *The Handbook of Eyewitness Psychology: Memory for People*. Mahway, New Jersey: Lawrence Erlbaum Associates. pp.3–34.
41. Gabbert, F., Memon, A. and Allan, K. (2003), Memory conformity: can eyewitnesses influence each other's memories for an event?. Appl. Cognit. Psychol., 17: 533–543.
42. Paterson, Helen M.; Richard I. Kemp, Jodie R. Ng (January–February 2011). "Combating Co-Witness Contamination: Attempting to Decrease the Negative Effects of Discussion on Eyewitness Memory". *Applied Cognitive Psychology* **25** (5): 43–52.
43. Sporer, S, & Penrod, S. (1995). Choosing, confidence, and accuracy: a meta-analysis of the confidence–accuracy relation in eyewitness identification studies . *Psychological Bulletin*, 118(3), 315 - 327.
44. Deffenbacher, K, & , Initials. (1980). Eyewitness accuracy and confidence. *Law and Human Behavior*, 4(4), 243-260.
45. Leippe, MR. (1980). Effects of integrative memorial and cognitive processes on the correspondence of eyewitness accuracy and confidence . *Law and Human Behavior*, 4(4), 261-274.
46. Pezdek, Kathy; Kathryn Sperry, Shana Owens (1). "Interviewing Witnesses: the Effect of Forced Confabulation on Event Memory". *JSTOR Arts & Sciences IV Archive Collection* **31** (5): 463.
47. Fisher, Ronald P (1992). *Memory-enhancing techniques for investigative interviewing: The cognitive interview*. Springfield, IL: Charles C Thomas. p.220.
48. Chan, Jason C.K.; Jessica A. LaPaglia (22 August 2011). "The dark side of testing memory: Repeated retrieval can enhance eyewitness suggestibility". *Journal of Experimental Psychology*.
49. Poole, Debra A.; Lawrence T. White (September 1993). "Two years later: Effect of question repetition and retention interval on the eyewitness testimony of children and adults". *Developmental Psychology* **29** (5): 844–853.
50. Gilbert, A. A. E., Fisher, R. P. (2006). The effects of varied cues on reminiscence in eyewitness memory. *Applied cognitive Psychology, 20*(6): 723-739.
51. MacLeod, M. (2002). Retrieval-induced forgetting in eyewitness memory: forgetting as a consequence of remembering. *Applied cognitive Psychology, 16*(2): 135-149.
52. Smith , S, & Vela, E. (1992). Environmental context-dependent eyewitness recognition. *Applied Cognitive Psychology*, 6(2), 125 - 139.
53. Pozzulo, Joanna (2007). "What the little eye spied: The dos and don'ts of interviewing children". *Royal Canadian Mounted Police Gazette* **69** (1): 20–21.
54. Phelps, E (2004). "Human emotion and memory: Interactions of the amygdala and hippocampal complex". *Current Opinion in Neurobiology* **14** (2): 198–202.
55. Richmond, Jenny; Nelson, Charles A. (NaN undefined NaN). "Accounting for change in declarative memory: A cognitive neuroscience perspective". *Developmental Review* **27** (3): 349–373.
56. Fivush, R; Schwarzmueller A (1999). "Children remember childhood: implications for childhood amnesia". *Applied Cognitive Psychology* **12** (5): 455–473.
57. Clevelend, E.; Reese, E (2008). "Children Remember Early Childhood: Long-term recall across the offset of childhood amnesia.". *Applied Cognitive Psychology* **22** (1): 127–142.
58. Goodman, G. S., & Schaaf, J. M. (1997). Over a decade of research on children's eyewitness testimony: What have we learned? Where do we go from here?. *Applied Cognitive Psychology, 11*, S6 – S20.
59. Ma, L., & Ganea, P. A. (2010). Dealing with conflicting information: Young children's reliance on what they see versus what they are told. *Developmental Science, 13*(1), 151 – 160.
60. Gordon, B. N., Baker-Ward, L., & Ornstein, P. A. (2001). Children's Testimony: A review on research of memory for past experiences. *Clinical Child and Family Psychology Review, 4*(2), 2001.

61. Ternes, Marguerite; John C. Yuille (November 2008). "Eyewitness memory and eyewitness identification performance in adults with intellectual disabilities.". *Journal of Applied Research in Intellectual Disabilities* **21** (6): 519–531.
62. Henry, Lucy A.; Gisli H. Gudjonsson (April 2007). "Individual and developmental differences in eyewitness recall and suggestibility in children with intellectual disabilities". *Applied Cognitive Psychology* **21** (3): 361–381.
63. Brady, T, & Konkle, T. (2008). Visual long-term memory has a massive storage capacity for object details. *PNAS, 1*03(38), 14325–14329.
64. Turtle, J.; Want, S. C. (1 October 2008). "Logic and Research Versus Intuition and Past Practice as Guides to Gathering and Evaluating Eyewitness Evidence". *Criminal Justice and Behavior* **35** (10): 1241–1256.
65. Haber, Lyn; Haber, Ralph Norman (1 January 1998). "Criteria for judging the admissibility of eyewitness testimony of long past events.". *Psychology, Public Policy, and Law* **4** (4): 1135–1159.

Dr. Simpson recommends the following books (and chapters)

Boyce, M., Beaudry, J., Lindsay, R.C.L., (2007). Belief in eyewitness evidence. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.501-528.

Brigham, J.C., (2002). Face identification: Basic processes and developmental changes. In *Memory and Suggestibility in the Forensic Interview.* Eisen, M.L., Quas, J.A., Goodman, G.S. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, p.115-142.

Brigham, J.C., Bennett, L.B., Meissner, C.A., Mitchell, T.L., (2007). The influence of race on eyewitness memory. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.257-282.

Bruce, V., Burton, M., Hancock, P., (2007). Remembering faces. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.87-100.

Caputo, D., Dunning, D., (2007). Distinguishing accurate identifications from erroneous ones: Post-dictive indicators of eyewitness accuracy. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.427-452.

Cutler, B.L., Wells, G.L., (2009). Expert testimony regarding eyewitness identification. In *Psychological Science in the Courtroom: Consensus and Controversy*. Skeem, J.L., Douglas, K.S., Lilienfeld, S.O. (Ed.). The Guildford Press, New York, pp.110-123.

Davis, D., Loftus, E., (2007). Internal and external sources of misinformation in adult witness memory. In *Handbook of Eyewitness Psychology, Vol. 1.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.195-238.

Dysart, J.E., Lindsay, R.C.L., (2007). Show-up identifications: Suggestive technique or reliable method. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.137-154.

Dysart, J.E., Lindsay, R.C.L., (2007). The effects of delay on eyewitness identification accuracy. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.361-376.

Engelberg, E., Christianson, S., (2002). Stress. Trauma, and memory In *Memory and Suggestibility in the Forensic Interview.* Eisen, M.L., Quas, J.A., Goodman, G.S. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, p.143-164.

Fisher, R.P., Brennan, K.H., McCauley, M.R., (2002). The cognitive interview method to enhance eyewitness recall. In *Memory and Suggestibility in the Forensic Interview.* Eisen, M.L., Quas, J.A., Goodman, G.S. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, p.265-286.

Fisher, R.P., Schreiber, N., (2007). Interview protocols for improving eyewitness memory. In *Handbook of Eyewitness Psychology, Vol. 1.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.55-80.

Griesel, D., Yuille, J.C., (2007). Credibility assessment in eyewitness testimony. In *Handbook of Eyewitness Psychology, Vol. 1.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.339-370.

Leippe, M., Eisenstadt, D., (2007),. Eyewitness confidence and the confidence-accuracy relationship to memory for people. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.377-426.

Malpass, R.S., Tredoux, C.G., McQuiston-Surrett, D., (2007). Lineup construction and lineup fairness. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.155-178.

McAllister, H., (2007). Mug books: More than just large photospreads. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.35-58.

Meissner, C.A., Sporer, S.L., Schooler, J.W., (2007). Person descriptions as eyewitness evidense. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.1-34.

Penrod, S., Bornstein, B., (2007). Generalizing eyewitness reliability research. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.529-556.

Pezdek, K., Taylor, J., (2002). Memory for traumatic events in children and adults. In *Memory and Suggestibility in the Forensic Interview.* Eisen, M.L., Quas, J.A., Goodman, G.S. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, p.165-184.

Pickel, K., (2007). Remembering and identifying menacing perpetrators: Exposure to violence and the weapon focus effect. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.339-360.

Read, J.D., Connolly, D.A., (2007). The effects of delay on long-term memory for witnessed events. In *Handbook of Eyewitness Psychology, Vol. 1.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.117-156.

Reisberg, D., Heuer, F., (2007). The influence of emotion on memory in the forensic setting. In *Handbook of Eyewitness Psychology, Vol. 1.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.81-116.

Roediger, H., Gallo, D.A., (2002). Processes affecting accuracy and distortion in memory: An overview. In *Memory and Suggestibility in the Forensic Interview.* Eisen, M.L., Quas, J.A., Goodman, G.S. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, p.3-28.

Schooler, J.W., Eich, E., (2000). Memory for emotional events. In *The Oxford Handbook of Memory*. Tulving, E., Craik, F.I.M. (Ed._, Oxford University Press, pp.379-394.

Shaw, J.S., McClure, K.A., Dysktra, J.A., (2007). Eyewitness confidence from the witnessed event through trial. In *Handbook of Eyewitness Psychology, Vol. 1.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.371-400.

Soraci, S.A., Carlin, M.T., Read, D., Pogoda, T.K., Wakeford, Y., Cavanagh, S., Shin, L., (2007). Psychological impairment, eyewitness testimony, and false memories. In *Handbook of Eyewitness Psychology, Vol. 1.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.261-298.

Van Wallendael, L.R., Devenport, J., Cutler, B.L., Penrod, S., (2007). Mistaken identification = erroneous conviction? Assessing and improving legal safeguards. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.557-572.

TOPIC: Child Eyewitness Memory (child testimony)

The following text borrows extensively from Wikipedia, which offers a helpful synopsis of ***child eyewitness testimony***.

An eyewitness testimony is a statement given under oath by a person present at an event who can describe what happened.[1][2] During circumstances in which a child is a witness to the event, the child can be used to deliver a testimony on the stand. The credibility of a child, however, is often questioned due to their underdeveloped memory capacity and overall brain physiology. Researchers found that eyewitness memory requires high-order memory capacity even for well-developed adult brain.[3] Because a child's brain is not yet fully developed, each child witness must be assessed by the proper authorities to determine their reliability as a witness and whether or not they are mature enough to accurately recall the event, provide important details and withstand leading questions.

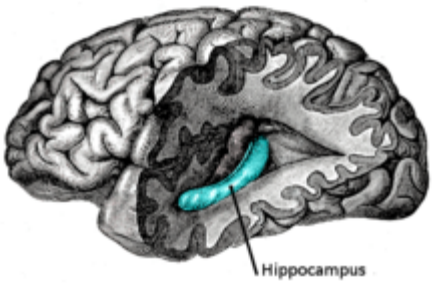
Brain Development Associated with Eyewitness Testimony

Brain development is an after-forward process; from the occipital lobe (visual), to the temporal lobe (sensory, auditory and memory), to the parietal lobe (motor, pain, temperature, and stress), and finally to the frontal lobe (language, reasoning, planning, and emotion).[4] All of these brain regions work together to build up our eyewitness memory.

Generally, infants are born with formed brain systems and their brains develop very rapidly during the first three years.[5] The size of a newborn brain is approximately 400g and continues to grow to 1100g at the age of three, which is close to the size of an adult brain (1300-1400g).[6] Although infants are born with a properly formed brain, they are still far away from full development. The glial cells, which play a vital role in proper brain function (e.g. insulating nerve cells with myelin), keep growing to divide and multiply after birth.[7] However, to have a fully developed eyewitness memory, the development of gray matter, white matter, the denate gyrus and density of synapses are highly necessary.

The volume of white matter starts its linear increase from age four to 20, but cortical gray matter is decreases in the parietal, occipital and temporal regions starting from age four, continually changing until after age 12.[8] The development of the denate gyrus starts forming at 12 to 15 months in the hippocampus, which is essential for the formation of declarative memory in eyewitness testimony.[5] After the formation of the dentate gyrus of the hippocampus, the density of synapses in the prefrontal cortex, which is involved in eyewitness memory, is peaks in its development during 15 to 24 months, changing until the age of adolescence.[5]

Major Brain Regions Necessary for Eyewitness Performance



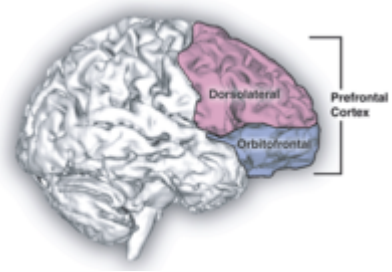
Hippocampus

The hippocampus is one of the brain structures located within the medial temporal lobe and is considered one of the main structures of the brain associated with eyewitness testimony because it is the area that is important for the formation of long term memories.[9] Declarative memories are long term memories that can be consciously remembered, which include: specific events and factual knowledge.[9] Eyewitnesses use declarative memories, specifically episodic memory when they are asked to recall specific events that took place in the past. For example, "*Do you remember what the doctor said to you last time you visited him?*" Research on children as eyewitnesses found that children do not have accurate long term memories for past events.[10]

The hippocampus is not yet completely developed until 2–8 years of age; however, there are mixed findings for the exact moment when the hippocampus stops maturing.[11] Though the hippocampus may stop maturing at a certain age, behavioral evidence shows that declarative memories are known to develop from childhood up until adulthood.[9]

A study looking at age differences in which children can remember episodic memories (e.g. their first day of school, attending a friend's birthday party), elementary and preschool students were questioned about delay interval in past experiences and found significant differences in what children recall. Elementary school students were more successful at this task than preschoolers. Overall, children need more prompts to remember past events and recall fewer details than older children.

Stress also appears to disrupt the function of the hippocampus as it reduces the likelihood for details to be remembered in a logical sequence.[10] Since most children are asked to recall stressful events for eyewitness testimonies, they may explain them in fragmented sequences of events.



The prefrontal cortex

Prefrontal Cortex

The prefrontal cortex is another brain region involved in eyewitness testimonies. Its function in relation to memory is to create memories that are vivid and that have a lot of contextual detail.[9] Research in the Journal of Law and Human Behaviour found that the ability for child eyewitnesses to accurately recall details of events increases with age, as did the ability to answer specific questions, identify the confederate and resist suggestion. Studies have found that children tend to give few details of the event and sometimes distort them in eyewitness testimonies.[10] This brain region is one of the last regions to develop.

Short term memory occurs in the prefrontal cortex. Working memory is another process that relies on the prefrontal cortex.[12]

Red section of the brain indicates the location of the temporal lobe

Temporal Lobe

The temporal lobes are involved in several functions of the body including: hearing, meaning, auditory stimuli, memory, and speech. They also play a role in emotion and learning [13] and are concerned with processing and interpreting auditory stimuli. This is a major location for memory storage and is associated with memory skills.

Parts of the temporal lobe show late maturation. These regions are of the last brain regions to mature.[14] The gray matter in the temporal lobe continues developing until it reaches its peak development at age 16 for both males and females.

The red areas indicate the location of the amygdala

Amygdala

The amygdala is located deep within the temporal lobe of the brain and is involved in the acquisition and retrieval of information on highly salient events.[15] It is also involved in several functions of the body, which include determining what and where memories are stored in the brain. The determination of what/where memories are stored is dependent on how big of an emotional response an event evokes.[15] This is related to eyewitness testimonies because young children usually have poorer recall for details of events, but when an event evokes a highly aversive response (unpleasant, arousing), they tend to remember it.

The amygdala does not stop developing until late adolescence. Research studies have found that in normal developing children, the volume of amygdala increases substantially between seven to 18 years of age.[16] This influences how children perform as eyewitnesses because children will have poorer skills for storing and recalling memories of events prior to the age of seven.

Short Term Memory

Short term memory is defined as the ability to store information for a short period of time. If it is rehearsed enough, it will be transferred into long term memory. This is important to know in regards to eyewitness testimonies because children have problems transferring short term memories to long term, as discussed previously.

Overall, there are a number of differences in memory among adults and children. With regards to short term memory, a child's capacity to store items is less than that of an adult. More specifically, evidence has shown that a five year old can only store up to five items in short term memory, whereas adults are able to store around seven items.[17] This can play a role in how accurate a child's memory performance is in comparison to an adolescent or an adult's recall of the same crime scene.

The amount of time elapsed from when the child witnessed the scene to when they give their testimony is also a contributing factor to how short term memory influences the accuracy of their recall as an eyewitness.[18] It was found that a child's short term memory is more susceptible to interference as the amount of time increases between the event and the testimony.[18] This can lead to misinformation on the child's part and an inaccurate recall of events.[18] One explanation for this is that information that is learned shortly after the event is combined with information that is being temporarily stored in short term memory, having yet to make it into long term memory, causing contradictory traces to coexist.[18]

Long Term Memory

Eyewitness testimonies can be impacted by long term memory by the loss of information during the process of encoding and storing event details into long term memory.[10] According to the information processing model, if sensory information about an event is not directly transferred from short term memory into long term memory, the information is difficult to retrieve. Research has also found that the rate of transfer of sensory information from short term to long term memory is related to age of the witness. Older children have higher success rates in transferring memory from short term to long term than younger children, which plays a role in why younger children have poorer recall in eyewitness testimonies.[10]

Selective attention also contributes to the impairment of younger children's information encoding process.[10] Namely, if children's attentions are disrupted by an object (e.g. a gun) while witnessing a crime, they might be unable to fully encode all of the details, resulting in poor recall of the event later on in life.

Factors Affecting Eyewitness Testimony

Retroactive Interference

Retroactive interference encourages incidental forgetting, in which the newly learned information impairs the retrieval of previously learned knowledge, especially for similar and related information.[19] For example, if you have already learned about proactive interference and recently learned new information about retroactive interference, the knowledge you learned about retroactive interference has the tendency to impede the retrieval of the knowledge of proactive interference.

The passage of time is not of major importance but still has relevance to retroactrive interference. The results of a study on rugby players by Hitch and Baddeley showed that trace decay contributes relatively nonsignificant effects on retroactive recall.[20]

Consolidation of the previously learned knowledge and the new information is important.[21] If the previously learned knowledge is well consolidated in memory, the impeding influence caused by the new encoding has less effect; inversely, if the newly learned information is better encoded than the old knowledge, the interference is greater. This is especially true when the previously learned knowledge is simply encoded in short-term and working memory—basically, the low level of consolidation.[20] The similarity between the new information and old knowledge can have an effect on performance as well. When the recently acquired information is phonologically and semantically similar with the known knowledge, the rate of retroactive interference is increased through confusion between the two materials.[22][23]

The encoding process, retrieval traces and contextual cues of the newly learned information play significant roles in impairment. The ways that information is encoded can impair the retrieval performance of that information. The better encoding, the better retrieval will be, especially under circumstances of appropriate retrieval traces and sufficient contextual cues.[24] How to retrieve the encoded information, a.k.a retrieval strategy, is also essential for preventing retroactive interference. The failure in binding and tracking the contextual information has an increased impact on the retroactive interference effect.[25]

Retroactive interference can also be attributed to personal experiences and memories. The schematic knowledge in memory is useful in forming expectations and drawing inferences for understanding, but it is also able to cause distortion and interference when the encoding information is inconsistent with what has been stored.[26] In addition, the extent of knowledge stored in memory has impacts on the accuracy of the encoding and storing of information.[27] Knowing a lot about a subject helps to improve the accuracy of other related subjects. A lack of essential experience can interfere with the processes of learned knowledge and increase the risk of retroactive interference when learning new information about the already learned subject.

Memory capacity involves the state of maturity and plasticity of the brain and can impair memory performance especially in terms of interference.[4] The development of brain function has a great influence on memory capacity which is responsible for the performance of memory. This includes verbal expression, object recognition, etc.

In children, memory capacity, source monitoring, and language development are limited because their brains are not yet mature. These limitations enhance the effect of retroactive interference on the accuracy of a child's eyewitness testimony. For instance, a five year-old child is generally able to tell the genital contact of a sexual abuse perpetrator, but it is difficult for the child to identify other features such as facial features and clothing due to their underdeveloped memory capacity.[28] The undeveloped conceptual functions of a child's brain restricts their capacities in object recognition, social cognition, language, and human capacity (the ability to remember the past and imagine the future), and impairs the retrieval and accuracy of their eyewitness memory.[24]

Due to their young age, children have less personal experience, making them vulnerable to impairments from retroactive interference. Therefore, when used as eyewitnesses, it is less possible for them to encode and store the features of the criminal in an appropriate or sufficient way, which impedes the accuracy of the eyewitness retrieval.

Stress and Trauma

There are many reason why children eyewitness testimonies may not be completely accurate, one of which could be stress and trauma. When children experience a traumatic and stressful event, their ability to accurately recall the event becomes impaired.

The American Psychological Association often claims that emotional events are remembered less accurately than details of neutral or everyday events. Their explanation for why stress and trauma could impair memories under high emotional arousal is a decrease in the available processing capacity which leads to lower memory processing.[29]

Stressful events can also have positive effects on children. Physiological evidence indicates that stressful events are retained particularly well the more children experience positive events in their lives.[30]

Other theorists have relied on The Yerkes-Dodson Law for explaining the effects of stress on a child's memories. The Yerkes-Dodson Law states that too little or too much stress is associated with a decline in memory. Too much stress can narrow someone's attention for stressful memories but aid in consolidation so that details are attended to. Goodman gave inoculations to 76 children between the ages of three and seven and found that those who were most severely distressed by the experience (those who screamed, cried, struggled) later remembered more about the event and were more resistant to suggestion than those who did not experience distress.[30]

In order to help reduce stress and trauma to the child, some studies have shown that good social support during the interviewing process can help children reduce their anxiety. If an interviewer is supportive by smiling, nodding his head and compliments the child during the interviewing process the child's anxiety decreased by a decent margin. The study also showed that the less supportive an interviewer was, the higher the child's anxiety rose. [31]

Early research has studied the impacts of emotion on memory. Sigmund Freud used his psychoanalytic approach to study people with hysteria. Freud found that people are constantly confronted with thoughts and some of the memories are too painful, so people become repressed.[32]

Another method by Kuehn analyzed the data from police reports about victims experiencing traumatic events. He looked specifically at how capable these victims were in being able to provide a description of the traumatic event in a police report. These victims experienced two homicides, 22 rapes, 15 assaults and 61 robberies, respectively. He found that victims of robberies were able to provide more detailed description for the events than did victims of rape or assault. He also found that people who were injured provided more less of description than non injured people.[32]

Stress and trauma can also cause create other problems in eyewitness testimonies such as repression. Repression has an impact on eyewitness testimonies because if a child goes through a stressful or traumatic event they will sometimes repress their memories. According to Freud's theory on repression, a repressed memory is the memory of a traumatic event unconsciously retained in the mind, where it is said to adversely affect conscious thought, desire, and action. As a result, children will have trouble recalling this information or accessing it consciously. If a child who has witnessed a traumatic event is used as an eyewitness, they may have a harder time recalling the event due to the possibility of memory repression.

According to the journal of Law and Human Behaviour, children who have been through traumatic events will find it harder to remember a regular event as opposed to a non-traumatic event. In a study conducted by Goodman, they found that non-abused children were more accurate in answering specific questions and made fewer errors in identifying an unfamiliar person in pictures.[33]

Intelligence

Another factor that has been studied as a contributing variable in the accuracy of child eyewitness testimony is intelligence. Individual differences in intelligence, based on IQ, have been used to explain variances in memory performance among children giving eyewitness testimonies.

The ability for a child to give a free narrative of what happened involves the practice of episodic memory and working memory, which are both influenced by an individual's capacity to cognitively process events.[34] A child's fluid and crystallized intelligence are theorized to predict memory recall.[34] Evidence has shown that higher verbal intelligence is positively correlated with memory performance and negatively correlated with suggestibility in children.[35]

Further analyses of research concerning intelligence and free recall have shown that there are relatively large differences in intelligence when a positive correlation between recall and intelligence is demonstrated.[36] This implies that intelligence significantly influences child eyewitness memory when comparing high and low levels; however, small differences in intelligence are not significant.[36]

Another finding in the influence of intelligence on a memory recall in children is that it seems to be age-dependent.[36] Differences in age group explains the variance in which intelligence has an effect on memory performance. Older children have higher correlations of intelligence and recall, whereas chronological age is more significant of a factor than intelligence for young children's eyewitness memory.[36] More specifically, a study examining the influence of fluid intelligence on recall of children's eyewitness memory regarding a videotaped event found that there was not a positive relationship between fluid intelligence and free narrative for six and eight year olds; however, the positive relationship was present for ten year olds.[36]

Likewise, in studies of real cases of children testimony, the general finding is that intelligence is a considerable predictor for witness reports for children in their late elementary school years, but not for children up to the age of six.[35] Therefore, the effect of individual differences in intelligence on eyewitness memory increases with the child's age.[36]

The range in children's intellectual capacities may explain the positive relationship between intelligence and eyewitness memory.[35] Intellectually disabled children and children with below average to very low IQ's have been included in studies examining the influence of intelligence on memory recall. It was found that when giving an eyewitness testimony, there is a stronger positive relationship between intelligence and recall for intellectually disabled children, with recall accuracy being poorer with children of lower IQ than for children with average or high intelligence.[37] A possible explanation for this may be that in comparison to a child of mainstream intelligence, children of lower intelligence encode weaker memory traces of events.[37]

Another explanation is that individuals with intellectual disabilities have poorer cognitive and language functioning, which would directly impact their performance on memory and language tasks.[38] A study examining the extent to which the degree of intellectual disability (mild to moderate) has an effect on the relationship between intelligence and witness memory found that there was no significant difference in same-aged children with mild intellectual disabilities (IQ 55-79) and children with normal intelligence (IQ 80-100). Individuals with moderate intellectual disabilities (IQ 40-54) performed significantly worse on almost every eyewitness measure.[39]

Suggestibility

In general, the judicial system has always been cautious when using children as eyewitnesses resulting in rules that demand all child testimonies be confirmed by designated officials prior to its acceptance as evidence in the court of law.[40] One of the reasons for this partiality is suggestibility—a state in which a person will accept the suggestions of another person and act accordingly.[41]With regards to court proceedings, a child's testimony or recollection of an event is especially vulnerable to leading questions.[40]

Although suggestibility decreases with age, there is a growing consensus that the presence of an interplay between individual characteristics and situational factors may affect suggestibility, in this case, of children. This explains why children of the same age may significantly vary in levels of suggestibility.[42]

There are several factors that contribute to a child's suggestibility. Age-related differences are often synonymous with developmental differences, though the latter, when not comparing two different age groups, has no effect on a child's suggestibility.[43] Basically, individual differences between children of the same age group do not play a significant role in a child's level of suggestibility. If there is a difference in suggestibility levels of children that are of the same age, they are most likely due to maturational differences in specific cognitive skills.[42]

Studies also show that it is not the leading questions themselves that can alter a child's recall of the event, but the event in question. When children are questioned about true events that they actually participated in, they are much more accurate with their answers. With suggested events in which the questioner is suggesting the child may have been involved, children become more suggestible and easier to influence. Younger children also have a larger tendency to change their answers when making "yes," "no," or "I don't know" statements.[42]

It is yet to be determined whether there is a particular age or level of specific cognitive functioning at which suggestibility becomes more of a universal trait or characteristic; However, a study involving four year-olds suggests that due to their development of theory of mind, this may be close to the age at which suggestibility begins its 'trait-like' transition.[42]

Emotion can also make children more suggestible. When using sad stories, children are much more vulnerable to misleading questions than when using angry or happy events. In an experiment, when asked to recall a sad story previously read to them, children were much more descriptive and detailed when answering misleading questions, as opposed to when regular, stories were used.[44] Very similar results were found in a separate experiment in which stress was induced in children.[45]

Children were also more likely to agree with misleading questions and more likely to incorporate fabricated details when asked to recall the event. In this experiment using sad, angry or happy stories, it is at age six that the researchers deemed the average age at which suggestibility levels off.

As with most factors that elicit suggestibility, susceptibility to emotional influences decrease with age. Possible reasons for this may be the increase in narrative skill, knowledge, memory abilities, as well as the ability to properly encode memories. It is also implied that older children may be less trusting of adults' omniscience and more willing to contradict them.[44]

In 1999, Ceci and Scullin developed the Video Suggestibility Scale for Children (VSSC), which measures individual differences in suggestibility in preschool children.[46] The scale was administered to children of 3–5 years of age.

The results suggested that children tend to respond affirmatively to suggestive questions and change their answers in response to negative ones. Older children were able to recall the events in the video better than younger children, but were also more likely to shift their answers in response to negative feedback. Overall, this scale and study supports Gudjonsson's view that there are at least two basic types of interrogative suggestibility [47]

From Childhood to Adolescence

In general, adolescents are far more trustworthy eyewitnesses than children. They are already fully mature in terms of cognition (i.e. narrative skills, memory recall and encoding, etc.) Researchers found that the ability to recall single pieces of spatial information developed until ages 11 to 12, while the ability to remember multiple units of information developed until ages 13 to 15. However, strategic self-organized thinking, which demands a high level of multi-tasking skill, continues to develop until ages 16 to 17.

The frontal lobe and prefrontal cortex continues to develop until late adolescence, depending on the complexity of the task. When accomplishing complicated tasks, teenagers are still developing the cognitive skills necessary to efficiently manage multiple pieces of information simultaneously. These skills improve over time as the connections between brain cells become more refined, enabling more information to be simultaneously managed.[48]

In regards to credibility as an eyewitness, adolescents are no longer easy to manipulate and are not suggestible like young children. This is due to obvious cognitive factors, as well as maturation as a person. Young children look at adults as powerful and extremely knowledgeable whereas adolescents are not so intimidated when questioned by adults.[49]

However, this does not mean that adolescents are invincible and impermeable when on the stand. Because adolescents have much more experience in the world, their knowledge may actually hinder their eyewitness performance. When asked about details of a story or movie that was just read or watched, college students were just as likely as sixth graders to produce detailed, but false additions.[45] This study further explains that this is a result of behavioural scripts. They used inferences from what they already knew about people, actions, and situations and acted based on their instincts.

For example, when asked about a movie about cheating on tests, the college students added details explaining why the student cheated although it was not included in the film. They described the thoughts and feelings of the student because they are able to draw from their own separate experiences and knowledge of the situation. However, third graders were found to be less suggestible in questioning due to their limited knowledge as well as their limited script involving cheating.

References

1. http://dictionary.reference.com/browse/eyewitness
2. http://www.businessdictionary.com/definition/eyewitness-testimony.html
3. Loftus, E., F. (1980). Impact of expert psychological testimony on the unreliability of eyewitness identification. Journal of Applied Psychology, 65(1): 9-15
4. Casey, B. J., Giedd, J. N., Thomas, K. M. (2000). Structural and functional brain development and its relation to cognitive development. Biological Psychology, 54(1-3), 241-257.
5. Bauer, P. J., & Pathman, T. (2008). Memory and early brain development. Encyclopedia on Early Childhood Development, 1-6
6. Dekaban, A.S., & Sadowsky, D. (1978) Changes in brain weights during the span of human life: relation of brain weights to body heights and body weights. Ann Neurology, 4, 345-356.
7. Neuronscience for kids

8. Giedd, J. N., Blumenthal, J., Jeffries, N. O., Castellanos, F. X., Liu, H., Zijdenbos, A., Rapoport, J. L. (1999) Brain development during childhood and adolescence: a longitudinal MRI study. Nature neuronscience, 2(10), 861-863.
9. Noa, O., Kao, Yun., Peter, Sokol., (2007). Development of declarative memory system in the brain. Nature Neuroscience. 10, 1198- 205.
10. Gail, G., Rudy B., Davis, L. (2001). Effects of past abuse experiences on children's eyewitness memory. Law and Human Behaviour, 25, 1-30.
11. Wertlieb, D., Rose, D. (1979). Maturation of maze behaviour in preschool children. Developmental Psychology, 15,478-479.
12. Department of Health and Human Services. (2011) Maturation of the Prefrontal Cortex. Retrieved from: http://www.hhs.gov/opa/familylife/tech_assistance/etraining/adolescent_brain/risk_taking/index.html
13. Lehr, R. (2011). Brain Functions and Map. Retrieved from http://www.neuroskills.com/brain-injury/brain-function.php
14. Gotgay, N., Giedd, J. N., Lusk, L., hayashi, K. M., Greenstein, D., Vaituzis, A. C., Nugent, T. F., Herman, D. H., Clasen, L. S., Toga, A. W. et al. (2004). Dynamic mapping of human cortical development during childhood through early adulthood. Proc Natl Acad Sci USA, 101, 8174-8179.
15. Ralph, A., Natalie, D., (2001). The amygdala's role in long-term declarative memory for gist and detail. Journal of Neuroscience, 3, 983-992.
16. Schumann, C., Hamstra, J., (2004). The amygdala is enlarged in children but not adolescence with autism; the hippocampus is enlarged in all ages. The Journal of Neuroscience, 24, 6392-6401.
17. Davies, G., Lloyd-Bostock, S., McMurran, M., & Wilson, C., (1996) Law and Criminal Justice: international developments In research and practice. Oxford, England: Walter De Gruyter Inc.
18. McCauley, M., & Fisher, R. P. (1996). Enhancing children's eyewitness testimony with cognitive interview. Oxford, England: Walter De Gruyter Inc.
19. Bower, G. H., Thompson-Schill, T., Tulving, E. (1994) Reducing retroactive interference: an interference analysis. Journal of experimental psychology: Learning, Memory, and Cognition, 20(1), 51-66
20. Baddeley, A. D., & Hitch, G. J., (1994) Developments in the concept of working memory. Neuropsychology, 8(4), 485-493. What is of great importance is the
21. Nadel, L., & Moscovitch, Morris. (1997) Memory consolidation, retrograde amnesia and the hippocampal complex. Current Opinion in Neurobiology, 7, 217-227
22. Hintzman, D. L., Curran, T., Oppy, B. (1992) Effect of similarity and repetition on memory: registration without learning? Journal of Experimental Psychology: Learning, Memory, and Cognitiion, 18(4), 667-680
23. Baddeley, A. D., & Dale, C. A. (1966) The effect of semantic similarity on retroactive interference in long- and short-term memory. Journal of Verbal Learning and Verbal Behaviour, 5, 417-420
24. Hayne, H., & Herbert, J. (2004) Verbal cues facilitate memory retrieval during infancy. J. Experimental Child Psychology, 89, 127-139.
25. Hedden. T., & Park, D. C. (2003) Contributions of source and inhibitory mechanisms to age-related retroactive interference in verbal working memory. Journal of Experimental Psychology: General, 132(1), 93-112.
26. Whitney, P. (2001)Schemas, frames, and scripts in cognitive psychology. International Encyclopedia of the Social & Behavioral Sciences,13522-13526
27. McNichol, S., Shute, R., Tucker, A. (1999) Children's eyewitness memory for a repeated event. Child Abuse & Neglect, 23(1), 1127-1139
28. Goodman, C. S., Bottoms, B. L., Rudy, L., Davis, S. L., & Schwartz-Kenney, B. (2001). Effects of past abuse experiences on children's eyewitness memory. Law and Human Behavior, 25(3), 269-98. Retrieved from http://search.proquest.com/docview/204157441?accountid=11233
29. Aharonian, A., Bornstein, B. (2008). Stress and eyewitness memory. Journal of Psychology and Law, 1, 2-3.
30. Goodman, G., Bottoms, B., Kenny, B. (1991). Children's testimony about a stressful event: improving children's reports. Journal of Narrative and Life History, 1 (1), 69- 99.
31. Davis, S. L., & Bottoms, B. L. (2002). Effects of social support on children's eyewitness reports: A test of the underlying mechanism. Law and Human Behavior, 26(2), 185-215.
32. Christiansen, S., (1992). Emotional stress and eyewitness memory: a critical review. Journal of American Psychological Association, 112, 284-309.
33. Goodman, G., Golding, J., Helgeson, V. (1987). When a child takes the stand: jurors perceptions of children's eyewitness testimonies. Journal of Human Behaviour and Law, 11,1-189.
34. Fry, A. F., & Hale, S. (2000). Relationships among processing speed, working memory, and fluid intelligence in children. Biological Psychology, 54, 1-34.
35. Chae, Y., & Ceci, S. J. (2005). Individual differences in children's recall and suggestibility: the effect of intelligence, temperament, and self-perceptions. Applied Cognitive Psychology, 19, 383-407.
36. Roebers, C. M., & Schneider, W. (2001). Individual differences in children's eyewitness recall: The influence of intelligence and shyness. Applied Developmental Science, 5(1), 9-20.

37. Young, K., Powell, M. B., & Dudgeon, P. (2003). Individual differences in children's suggestibility: A comparison between intellectual disabled and mainstream samples. Personality and Individual Differences, 35, 31-39.
38. Agnew, S. E., & Powell, M. B. (2004). The effect of intellectual disability on children's recall of an event across different question types. Law and Human Behaviour, 28(3), 273-294.
39. Henry, L. A. & Guoljonsson, G. H. (2003). Eyewitness memory, suggestibility, and repeated recall sessions in children with mild and moderate intellectual disabilities. Law and Human Behaviour. 27(5), 481-505.
40. Ceci, S. J., Ross, D. F., & Toglia, M. P. (1987). Suggestibility of children's memory: Psycholegal implications. Journal of Experimental Psychology: General, 116(1), 38-49.
41. suggestibility. CollinsDictionary.com. Collins English Dictionary - Complete & Unabridged 11th Edition. Retrieved September 22, 2012
42. Scullin, M. H., Kanaya, T., & Ceci, S. J. (2002). Measurement of individual differences in children's suggestibility across situations. Journal of Experimental Psychology: Applied, 8(4), 233-246. doi: 10.1037/1076-898X.8.4.233
43. Ceci, S. J., Ross, D. F., & Toglia, M. P. (1988). On remembering . . . more or less: A trace strength interpretation of developmental differences in suggestibility. Journal of Experimental Psychology: General, 117(2), 201-203.
44. Levine, J. L., Laney, C., & Burgess, S. L. (2008). Effects of discrete emotions on young children's suggestibility. Developmental Psychology, 44(3), 681-694. doi: 10.1037/0012-1649.44.3.681
45. Ceci, S. J., & Bruck, M. (1993). Suggestibility of the child witness: A historical review and synthesis.Psychological Bulletin, 113(3), 403-439.
46. Scullin, M. H., & Ceci, S. J. (2001). A suggestibility scale for children. Personality and Individual Differences, 30, 843-856. doi: 10.1016/S0191-8869(00)00077-5
47. Gudjonsson, G. H. (1984). A new scale of interrogative suggestibility. Personality and Individual Diff□erences, 5, 303-314.
48. http://www.sciencedaily.com/releases/2005/05/050518104401.htm
49. Levine, L. J., Burgess, S. L., & Laney, C. (2008). Effects of discrete emotions on young children's suggestibility. Developmental Psychology, 44(3), 681-694. doi: 10.1037/0012-1649.44.3.681

Relevant Research Articles related to Child Testimony

Deficient cognitive control fuels children's exuberant false allegations.

Poole, Debra Ann, Dickinson, Jason J., Brubacher, Sonja P., Liberty, Allison E., Kaake, Amanda M., (2014). Journal of Experimental Child Psychology, Vol 118, Feb, 2014. pp. 101-109.

Abstract:

In eyewitness studies as in actual investigations, a minority of children generate numerous false (and sometimes incredulous) allegations. To explore the characteristics of these children, we reinterviewed and administered a battery of tasks to 61 children (ages 4–9 years) who had previously participated in an eyewitness study where a man broke a "germ rule" twice when he tried to touch them. Performance on utilization, response conflict (Luria tapping), and theory of mind tasks predicted the number of false reports of touching (with age and time since the event controlled) and correctly classified 90.16% of the children as typical witnesses or exuberant (more than 3) false reporters. Results of a factor analysis pointed to a common process underlying performance on these tasks that accounted for 49% of the variability in false reports. Relations between task performance and testimony confirmed that the mechanisms underlying occasional intrusions are different from those that drive persistent confabulation and that deficient cognitive control fuels young children's exuberant false reports.

Individual Differences in Children's Suggestibility: A Review and Synthesis.

Bruck, Maggie, Melnyk, Laura, Applied Cognitive Psychology, Vol 18(8), Dec, 2004. Special issue: Individual and Developmental Differences in Suggestibility. pp. 947-996.

Abstract:

Over the last decade, there has been a significant growth in the study of individual differences factors predicting children's suggestibility. In this paper, we synthesize the results of 69 studies examining the relationship of demographic factors (socioeconomic status and gender), cognitive factors (intelligence, language, memory, theory of mind, executive functioning, behavioural ratings of distractibility, and creativity), and psycho-social factors (social engagement, self concept/self-efficacy, stress/emotional arousal/state anxiety, maternal attachment styles, parent-child relationship, parenting styles, temperament, and mental health) and children's suggestibility. We found that for cognitive factors, language ability and

creativity were fairly consistently related to suggestibility. The highest correlations for psycho-social factors and suggestibility were obtained for measures of self-concept/self-efficacy, maternal attachment, and the parent-child relationship. Implications for future research and mechanisms underlying children's suggestibility are discussed.

Children's memory for their mother's murder: Accuracy, suggestibility, and resistance to suggestion.
McWilliams, Kelly, Narr, Rachel, Goodman, Gail S., Ruiz, Sandra, Mendoza, Macaria, Memory, Vol 21(5), Jul, 2013. Special issue: Memory and The Law: Case Studies. pp. 591-598.
Abstract:
From its inception, child eyewitness memory research has been guided by dramatic legal cases that turn on the testimony of children. Decades of scientific research reveal that, under many conditions, children can provide veracious accounts of traumatic experiences. Scientific studies also document factors that lead children to make false statements. In this paper we describe a legal case in which children testified about their mother's murder. We discuss factors that may have influenced the accuracy of the children's eyewitness memory. Children's suggestibility and resistance to suggestion are illustrated. Expert testimony, based on scientific research, can aid the trier of fact when children provide crucial evidence in criminal investigations and courtroom trials about tragic events.

Editor's preface to the special issue.
Geffner, Robert (Ed). Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders, Vol 21(1), Jan, 2012. pp. 1-2.
Abstract:
Over the past three decades, there have been contested issues and controversies about the most appropriate and effective techniques for investigating and forensically interviewing children when sexual abuse allegations occur. The current special issue of the Journal of Child Sexual Abuse focuses on some of the controversies and contested issues, and also challenges some of the ideas advanced by some authors in the Kuehnle and Connell book. Commentaries by some of the authors of this special issue and other experts in the field will also be published. It is hoped that this exchange will enable greater consensus about evaluating child sexual abuse allegations, thereby ensuring that children who have been sexually abused are identified in the evaluation or investigation of the allegations, and that children who have not been sexually abused are also correctly categorized.

Putting it all together.
Finkel, Martin. Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders, Vol 20(6), Nov, 2011. pp. 643-656.
Abstract:
The most available form of evidence in child sexual abuse cases is what the child has to say about his or her alleged experience. The most difficult skill for clinicians to develop is the "how tos" of talking to children in a developmentally appropriate, nonjudgmental, facilitative, and empathetic manner. This manuscript provides insight into obtaining historical details about a child's experience and guidance regarding how to incorporate those details when formulating a balanced and defensible opinion. The consultative report should be an instrument to explain the presence or absence of physical findings, the significance of symptoms temporally related to sexual contact, and discrepancies between a child's perception of an experience and physical findings.

A call for field-relevant research about child forensic interviewing for child protection.
Olafson, Erna. Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders, Vol 21(1), Jan, 2012. pp. 109-129.
Abstract:
This article reviews some sensitivity versus specificity imbalances in forensic investigations of child sexual abuse. It then proposes the development or further testing of additional approaches for those children who do not respond to the current, single-interview National Institute of Child Health and Human Development (NICHD) protocol. Although there are other interview protocols based on similar principles, the NICHD protocol has the strongest evidence base in both field and laboratory studies to

elicit detailed and accurate information from children. Adaptations of the NICHD protocol or additional approaches need to be developed and tested for nondisclosing, partially disclosing, or recanting children, very young children, children with developmental disabilities, and children whose sexual abuse allegations are evaluated in the context of custody or visitation disputes.

Interviewing children versus tossing coins: Accurately assessing the diagnosticity of children's disclosures of abuse.
Lyon, Thomas D., Ahern, Elizabeth C., Scurich, Nicholas. Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders, Vol 21(1), Jan, 2012. pp. 19-44.
Abstract:
We describe a Bayesian approach to evaluating children's abuse disclosures and review research demonstrating that children's disclosure of genital touch can be highly probative of sexual abuse, with the probative value depending on disclosure spontaneity and children's age. We discuss how some commentators understate the probative value of children's disclosures by: confusing the probability of abuse given disclosure with the probability of disclosure given abuse, assuming that children formally questioned about sexual abuse have a low prior probability of sexual abuse, misstating the probative value of abuse disclosure, and confusing the distinction between disclosure and nondisclosure with the distinction between true and false disclosures. We review interviewing methods that increase the probative value of disclosures, including interview instructions, narrative practice, noncontingent reinforcement, and questions about perpetrator/caregiver statements and children's reactions to the alleged abuse.

A response to commentary on Faust, Bridges, and Ahern's (2009) "Methods for the identification of sexually abused children".
Ahern, David C., Bridges, Ana J., Faust, David. Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders, Vol 21(2), Mar, 2012. Special issue: Male and female survivors of sexual abuse. pp. 210-219.
Abstract:
Responds to the comments made by M. D. Everson and K. C. Faller (see record 2012-04562-004) & T. D. Lyon et al (see record 2012-04562-003) on the current authors' chapters in the book The Evaluation of Child Sexual Abuse Allegations: A Comprehensive Guide to Assessment and Testimony (see record 2009-01883-000). Our series of three chapters (Faust, Bridges, & Ahern, 2009a, 2009b; Bridges, Faust, & Ahern, 2009) on the methodology of identifying sexually abused children elicited a number of comments, both supportive and critical. The criticisms appear related to three primary issues or apparent misconceptions of our work, perhaps due in part to incomplete exposition or ambiguity in presented material: our use of hypotheticals, our argument against "double-dipping," and our use of Bayesian analyses. We address each of these criticisms here in the hope of clarifying any misunderstandings and contributing in a constructive way to progress in this critical arena.

Event memory and suggestibility in abused and neglected children: Trauma-related psychopathology and cognitive functioning.
Chae, Yoojin, Goodman, Gail S., Eisen, Mitchell L., Qin, Jianjian. Journal of Experimental Child Psychology, Vol 110(4), Dec, 2011. pp. 520-538.
Abstract:
This study examined event memory and suggestibility in 3- to 16-year-olds involved in forensic investigations of child maltreatment. A total of 322 children were interviewed about a play activity with an unfamiliar adult. Comprehensive measures of individual differences in trauma-related psychopathology and cognitive functioning were administered. Sexually and/or physically abused children obtained higher dissociation scores than neglected children, and sexually abused children were more likely to obtain a diagnosis of posttraumatic stress disorder than physically abused children, neglected children, and children with no substantiated abuse histories. Overall, older children and children with better cognitive functioning produced more correct information and fewer memory errors. Abuse status per se did not significantly predict children's memory or suggestibility whether considered alone or in interaction with age. However, among highly dissociative children, more trauma symptoms were associated with greater inaccuracy, whereas trauma symptoms were not associated with increased error

for children who were lower in dissociative tendencies. Implications of the findings for understanding eyewitness memory in maltreated children are discussed.

Methodological issues and practical strategies in research on child maltreatment victims' abilities and experiences as witnesses.
Chae, Yoojin, Goodman, Gail S., Bederian-Gardner, Daniel, Lindsay, Adam. Child Abuse & Neglect, Vol 35(4), Apr, 2011. pp. 240-248.
Abstract:
Modern scientific research on child maltreatment victims' memory abilities and court experiences has informed and guided legal professionals, policy makers, mental health professionals, and the lay public for nearly three decades. The importance of addressing legal, psychological, and clinical issues on behalf of child witnesses has spawned an abundance of research. For the past several decades, our laboratory has conducted a number of research projects to examine child maltreatment victims' abilities and experiences as witnesses. In this paper, we first review several scientific studies performed by our laboratory with maltreated children and adults. Specifically, we describe some of the laboratory's key studies on maltreated children's memory and suggestibility and then some of our key studies on maltreated children's reactions to criminal and dependency court, including their later reactions as adults. Following this, we address practical strategies used to deal with many of the challenges involved in child witness research projects when actual child victims are involved. We focus on methods for recruiting maltreatment victims, seeking informed consent for research participation, ensuring representativeness of samples, selecting appropriate interview questions and questionnaires, and retaining participants longitudinally. When considering each of these, we first address a number of general points, and then separately discuss problems and practical strategies that emanate from research on memory and suggestibility of maltreated children, followed by problems and practical strategies that arise in research on children's legal involvement. The one exception is that in considering practical challenges of conducting longitudinal research, the issues for memory and suggestibility research and those for children's legal involvement studies largely overlap and are discussed together.

Commentaries on contested issues in the evaluation of child sexual abuse allegations: Introduction to the current commentaries.
Faller, Kathleen Coulborn, Everson, Mark D., Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders, Vol 21(2), Mar, 2012. Special issue: Male and female survivors of sexual abuse. pp. 200-202.
Abstract:
The Evaluation of Child Sexual Abuse Allegations: A Comprehensive Guide to Assessment and Testimony is composed of 20 chapters written by scholars with diverse areas of expertise, such as clinical decision making, child forensic interviewing, research on memory and suggestibility, and professional ethics. The majority of chapters offer excellent reviews of relevant research as well as practical guidelines for forensic evaluators seeking to update to best practice standards. However, at least four chapters in the Kuehnle and Connell (2009) book dispute the validity of long-established forensic methodology. Because of concerns that such criticisms of established practice may be mistaken by the courts and child welfare professionals as representative of empirical or expert consensus, we assembled a group of experienced forensic evaluators and respected child maltreatment researchers to prepare articles that challenge the most troubling chapters in the Kuehnle and Connell book. The resulting six articles were published as a recent special issue of the Journal of Child Sexual Abuse (JCSA) (2012, Volume 21, Issue 1) entitled, "Contested Issues in the Evaluation of Child Sexual Abuse Evaluations." The six commentaries in this section continue the discussion of this critical debate about what constitutes appropriate practice in CSA evaluations. The reader is cautioned that each commentary represents only one side of the debate. As authors of two of the JCSA special issue articles (Everson & Faller, 2012; Faller & Everson, 2012), we urge the reader to refer to the special issue articles, as well as the original Kuehnle and Connell chapters, for a more complete perspective.

Children's eyewitness memory: Methodological issues.

Goodman, Gail S., Pipe, Margaret-Ellen, McWilliams, Kelly, Research methods in forensic psychology. Rosenfeld, Barry (Ed.); Penrod, Steven D. (Ed.); pp. 257-282. Hoboken, NJ, US: John Wiley & Sons Inc, 2011. xvi, 535 pp.

Abstract:
(from the chapter) In this chapter, we first describe a modicum of case law that concerns child witnesses. We then turn to a brief history of scientific research on child eyewitness memory. Internal and external validity issues and ethical concerns are also reviewed. We then discuss methodological issues regarding trauma and child memory, child maltreatment and memory, children's suggestibility and false memory, forensic protocols, and children's testimony in court.

Talking with children about past events: Children's memory and suggestibility.

Gregory, Amy Hyman, Carol, Rolando N., Compo, Nadja Schreiber, A clinician's guide to normal cognitive development in childhood. Sandberg, Elisabeth Hollister (Ed.); Spritz, Becky L. (Ed.); pp. 159-175. New York, NY, US: Routledge/Taylor & Francis Group, 2010. x, 257 pp.

Abstract:
(from the chapter) Although much of this chapter will have a legal/forensic perspective, the issues discussed have important implications for all clinicians, practitioners, and educators who are working with children in a variety of settings. Namely, to understand the harmful effects that suggestibility can have on children's recollections of personal experiences is important for anyone interacting with children. For example, what would you do if you suspected that a child might be the victim of abuse or a bullying situation? How do you verify a child's report about a domestic violence situation or make decisions regarding the child's best interests when a child is trapped in the midst of a bitter parental divorce? Having the best interest of the child at heart, most professionals would strive to obtain as much information as possible from the child, resulting in the child being asked many questions. However, the way a child is questioned about a negative experience may influence his or her memory for what happened. Therefore, a primary goal of this chapter is to build upon what we know about children's memory (Chapters 7 and 8) to help readers understand the most effective and least damaging procedures to use when talking to children about past experiences. Investigating children's nonabuse experiences (e.g., witnessing a bad car accident, negative interactions with a teacher) should be approached with the same care and precautions that one might use when concerned about an abuse situation. The variables and techniques described in the following sections evolved from forensic interviews surrounding suspected child abuse but should be applied to any situation in which children talk about negative events.

Child maltreatment and memory.

Goodman, Gail S., Quas, Jodi A., Ogle, Christin M., Annual Review of Psychology, Vol 61, 2010. pp. 325-351.

Abstract:
Exposure to childhood trauma, especially child maltreatment, has important implications for memory of emotionally distressing experiences. These implications stem from cognitive, socio-emotional, mental health, and neurobiological consequences of maltreatment and can be at least partially explained by current theories concerning the effects of childhood trauma. In this review, two main hypotheses are advanced: (a) Maltreatment in childhood is associated with especially robust memory for emotionally distressing material in many individuals, but (b) maltreatment can impair memory for such material in individuals who defensively avoid it. Support for these hypotheses comes from research on child abuse victims' memory and suggestibility regarding distressing but nonabusive events, memory for child abuse itself, and autobiographical memory. However, more direct investigations are needed to test precisely when and how childhood trauma affects memory for emotionally significant, distressing experiences. Legal implications and future directions are discussed.

Children as witnesses.

Davies, Graham, Pezdek, Kathy, Forensic psychology. Towl, Graham J. (Ed.); Crighton, David A. (Ed.); pp. 178-194. Wiley-Blackwell, 2010. xv, 458 pp.

Abstract:
(from the chapter) When children are victims of a crime, frequently their testimony is the only prosecution evidence in the case. This is because crimes against children—particularly crimes of child

abuse - typically occur in situations that are unlikely to involve other evidence or other witnesses. It is thus especially important that child witness evidence be collected, documented and evaluated carefully. Elsewhere, Pezdek (1994) has argued about the costs and benefits of weighing children's eyewitness accounts too lightly or too heavily. Suffice it to say here, that weighing children's eyewitness accounts too lightly can result in the perpetuation of child victimisation; weighing children's eyewitness accounts too heavily can result in false charges that can permanently destroy families. In light of the dire consequences at both ends of this criterion, it is critical for forensic investigators and the courts to understand the factors that affect children's memory for traumatic events, and to follow procedures that are most likely to maximise the veracity of children's accounts. In this chapter we first present what is known from the scientific research about factors that affect the veracity of children's memory, with the focus on the topics of the suggestibility of children's memory and false memories for childhood events. Second, we review research on interview procedures and the special measures that have been suggested for interviewing children and presenting their evidence at court and discuss the experimental and field research on the utility of these procedures. Together, these two sections of this chapter provide the reader with a solid understanding of how best to interview children and present their evidence at court and the scientific basis for these recommendations. We believe that professionals are more likely to follow the suggested procedures if they understand the rationale for them.

Children's false memory and true disclosure in the face of repeated questions.
Schaaf, Jennifer M., Alexander, Kristen Weede, Goodman, Gail S., Journal of Experimental Child Psychology, Vol 100(3), Jul, 2008. pp. 157-185.
Abstract:
The current study was designed to investigate children's memory and suggestibility for events differing in valence (positive or negative) and veracity (true or false). A total of 82 3- and 5-year-olds were asked repeated questions about true and false events, either in a grouped order (i.e., all questions about a certain event asked consecutively) or in a nongrouped order (i.e., questions about a certain event were interspersed with questions about other events). Interviewer gender was also varied. Individual differences, including attachment style, inhibition, and behavioral adjustment, were examined as potential predictors of memory and suggestibility. Results revealed significant age, valence, and veracity effects on children's memory reports. Path analysis demonstrated that individual differences in behavioral problems and inhibitory ability predicted children's provision of inaccurate information. Implications for psychological theory and legal application are discussed.

Children, sexual abuse and suggestibility: What laypeople think they Know and what the literature tells us.
Cossins, Anne, Psychiatry, Psychology and Law, Vol 15(1), Mar, 2008. pp. 153-170.
Abstract:
This article summarizes the extensive research literature on laypeople's and jurors' beliefs about children's memory, suggestibility and responses to child sexual abuse. In particular, it discusses the extent and types of misconceptions held by laypeople/jurors, as well as the effects of age, education and gender on those misconceptions. The results from an analysis of mock jury studies where different types of expert testimony were presented are then considered in order to understand the types of expert testimony that would be admissible in courts in Australia, with a particular focus on the Uniform Evidence Act. As a result of this analysis, particular reform options are discussed and recommended in order to counter juror misconceptions in child sexual abuse trials.

A comparison of expert evidence and judicial directions to counter misconceptions in child sexual abuse trials.
Goodman-Delahunty, Jane, Cossins, Anne, O'Brien, Kate, Australian and New Zealand Journal of Criminology, Vol 44(2), Aug, 2011. pp. 196-217.
Abstract:
Studies on the influence of expert evidence and judicial instructions in child sexual abuse (CSA) cases have produced mixed outcomes. Using repeated measures, we tested the effectiveness of expert evidence and judicial directions in challenging common misconceptions about children's memory and responses to sexual abuse. A CSA Misconceptions Questionnaire was administered to 118 psychology undergraduates

who later served as virtual jurors in a simulated criminal trial. Specialized CSA knowledge was provided by a psychologist or via judicial directions. Expert evidence had two levels: clinical versus scientific testimony. Timing of judicial instructions had two levels: directions presented before the child testified versus during the judge's summing up. In a fifth control condition, no specialized CSA information was included. After reading a trial transcript, mock-jurors assessed witness credibility, rendered verdicts and again completed the CSA Misconceptions Questionnaire. All four interventions significantly increased jurors' CSA knowledge. The more they knew, the more likely they were to convict. Perceived victim credibility fully mediated the effect of CSA knowledge on verdict: information presented via expert testimony or judicial directions enhanced perceptions of victim credibility, which in turn increased convictions. Conviction rates were significantly higher in response to expert testimony from a clinical psychologist and a judicial instruction provided in the trial summation. These results are promising for courts and policy-makers grappling with low conviction rates in CSA jury trials.

Articles on "Delayed Disclosure of Child Sex Abuse"

Relationship to Perpetrator, Disclosure, Social Reactions, and PTSD Symptoms in Child Sexual Abuse Survivors. Ullman, Sarah E.; Journal of Child Sexual Abuse, Vol 16(1), 2007. pp. 19-36.

Abstract

This research examined victim relationship to the perpetrator, disclosure characteristics, social reactions, and PTSD in adult survivors' of child sexual abuse (CSA) identified in a convenience sample of 733 college students. Results indicated that relationship to the perpetrator was related to CSA characteristics and outcomes. More negative reactions such as disbelief were observed for those victimized by relatives compared with acquaintance and stranger victims, especially for those disclosing in childhood. Victims of relatives had more PTSD symptoms if they delayed disclosure, received more negative reactions in childhood, and engaged in self-blame at the time of the abuse. Results are discussed in the context of Fred's (1996) betrayal trauma theory, in order to better understand the traumatic impact of CSA.

Delayed Disclosure of Alleged Child Abuse Victims in Israel. Hershkowitz, Irit; American Journal of Orthopsychiatry, Vol 76(4), Oct 2006. pp. 444-450.

Abstract

This study identifies characteristics of alleged child abuse victims that are associated with delayed disclosure of abuse. The database includes all alleged victims investigated in Israel between 1998 and 2004. Analyses suggest that most children delay disclosure and that delay is associated with type of abuse, child's age and gender, relationship to suspect and characteristics of abusive event.

The hearsay rule and delayed complaints of child sexual abuse: The law and the evidence. Cossins, Anne; Psychiatry, Psychology and Law, Vol 9(2), 2002. pp. 163-176.

Abstract

This article discusses the implications of two recent High Court cases on the admissibility of hearsay evidence of a child's delayed disclosure of child sexual abuse. It compares and contrasts the traditional legal significance of delayed disclosure (as being evidence of fabrication) with prevalence studies from the psychological literature which show that a majority of children delay disclosure and that, rather than being an aberrant feature of child sexual abuse, delay is a typical response of sexually abused children as a result of confusion, denial, self-blame and overt and covert threats by offenders. In addition, several self-report studies of offenders confirm that grooming processes create a relationship of power between the child and offender such that delayed disclosure appears to reflect the position of powerlessness of the sexually abused child within that relationship. In light of what the psychological literature tells us, this article challenges the narrow legal approach to the admissibility of hearsay evidence of delayed disclosure and suggests that a special exception should be made for hearsay statements of a child's delayed disclosure in child sexual assault trials.

Variables in delayed disclosure of childhood sexual abuse. Somer, Eli; Szwarcberg, Sharona; American Journal of Orthopsychiatry, Vol 71(3), Jul 2001. pp. 332-341.

Abstract

In a study of 41 adult survivors (aged 16-56 yrs) of childhood sexual abuse, the level of childhood traumatization was found to have contributed to delayed disclosure of the abuse. Other delaying variables

included: belief in the importance of obedience to grownups, mistrust of people, fear of social rejection, and fear of the criminal justice system. Variables such as media attention to similar cases and experiences of personal achievement were inversely related to the age at disclosure. Recommendations for policy are discussed.

Children's self-disclosure of sexual abuse: Effects of victim, perpetrator, and abuse characteristics. Paine, Mary Lou; Dissertation Abstracts International: Section B: The Sciences and Engineering, Vol 61(4-B), Oct 2000. pp. 2215.

Abstract

A child's disclosure of sexual abuse is critical to end the abuse, initiate legal and therapeutic intervention, and protect other children. Research findings indicate delayed disclosure is the norm and many victims never disclose. An extensive review of the literature revealed few empirical studies specific to disclosure. Most studies have examined disclosure in the context of a formal abuse investigation, medical examination, or psychotherapy. Using an archival design, data was gathered on 103 victims (75 girls, 32 boys) accessed through the files of convicted adult males who received treatment in an inpatient sex-offender program. The study was a comprehensive, integrated examination of self-disclosure of sexual abuse by child victims prior to investigation. The effects of victim, perpetrator, victim-perpetrator relationship, and abuse characteristics on disclosure and delay to disclosure were examined. Gender differences in abuse characteristics and aspects of disclosure were also examined. Delay to disclosure proved to be a more sensitive measure with the capacity to detect degrees of reluctance. Abuse by a parent/parent-figure, penetration, home violence, abuse duration, and younger age at onset were associated with significantly longer disclosure delays. Prior research reveals mixed findings regarding gender differences in disclosure. It is generally believed boys are more hesitant than girls to disclose. Findings of the present study revealed no gender differences in rates of disclosure prior to investigation. The mean disclosure delay was twice as long for girls than boys, however. The gender difference observed appeared secondary to the relationship between the victim and the perpetrator. Compared to boys, proportionately more girls were victimized by a parent/parent-figure and fewer were victimized by a non-family member. The confidant delayed or failed to report the abuse to the appropriate authorities in 24% of the cases in which the victim disclosed. Social and research implications are discussed. Suggestions are offered for data collection during investigative interviews in order to facilitate research on disclosure and reporting failures.

Developmental differences in detection and disclosure of sexual abuse. Campis, Leslie B.; Hebden-Curtis, Joanne; DeMaso, David R.; Journal of the American Academy of Child & Adolescent Psychiatry, Vol 32(5), Sep 1993. pp. 920-924.

Abstract

Examined developmental differences in the detection and disclosure of child sexual abuse. A random medical record review was conducted of 72 children and adolescents (aged 23 mo to 17 yrs) seen over a 3-yr period for suspected sexual abuse in the emergency room of a pediatric hospital. Data on demographics, presenting symptomatology, type of disclosure, and precipitants to disclosure were gathered. Preschool-age Ss were significantly more likely than school-age Ss and adolescents to exhibit behavioral or physical symptoms that prompted caregivers' suspicion of sexual abuse. Preschool-age Ss made disclosures accidentally and typically with an immediate precipitating event unrelated to the abuse itself. In contrast, sexual abuse disclosures from school-age Ss were purposeful and not associated with a precipitating event.

Forensic sexual abuse evaluations of older children: Disclosures and symptomatology. Elliott, Diana M.; Briere, John; Behavioral Sciences & the Law, Vol 12(3), Sum 1994. pp. 261-277.

Abstract

Examined the results of forensic evaluations of 320 children (aged 8-15 yrs) who were seen at an urban evaluation center regarding allegations of sexual abuse. Ss were given a medical examination and were asked to complete the Trauma Symptom Checklist for Children to assess psychological distress. Ss and primary nonoffending caretakers were interviewed to determine demographic, family environment, and abuse variables. Ss were grouped according to the outcome of the evaluation: nonabused, abused-disclosing, and abused-nondisclosing. Variables that predicted group membership included race, sex,

cognitive delays, mother's belief or disbelief in the allegation, and psychological distress. Sexually abused Ss who disclosed abuse reported particularly high levels of distress, while abused but nondisclosing Ss reported the lowest levels. Nonabused Ss reported intermediate symptom levels.

Factors associated with disclosure during child sexual abuse assessment. Gries, Leonard T.; Goh, David S.; Cavanaugh, Jeanne; Journal of ***Child Sexual Abuse***, Vol 5(3), 1996. pp. 1-20.
Abstract
Studied the relationship among the eliciting stimulus for sexual abuse disclosure, the child's age and gender, and the sexual abuse type reported by the child. 96 3-17 yr old children in foster care placement were referred due to suspicion of sexual abuse or a previous disclosure by the S or another person. Interviews indicated close to 67% of the Ss disclosed at least 1 type of sexual abuse, with almost 40% of those who had not disclosed before disclosing for the 1st time. Fondling, physical abuse, genital penetration, and touching the offender were the most frequently disclosed sexual abuse types. "Personal history" and "interview/worst experience" were the most effective stimuli in eliciting disclosure. A number of significant differential effects due to age, gender, and diagnosed disorder of the S were found on the eliciting stimuli and/or types of sexual abuse disclosed. Implications for child sexual abuse assessment practice are discussed.

Factors influencing children to self-disclose sexual abuse. Paine, Mary L.; Hansen, David J.; Clinical Psychology Review, Vol 22(2), Mar 2002. pp. 271-295.
Abstract: Self-disclosure by victims of child sexual abuse (CSA) is critical to initiate legal and therapeutic intervention. Unfortunately, research indicates that lengthy delays in disclosure and even nondisclosure are common. A comprehensive review of the clinical and research literature on CSA and an overview of related bodies of literature was conducted. Areas addressed include the context of sexual abuse as it relates to disclosure, the context and elements of children's disclosures, motivational factors inhibiting disclosure, and models of the disclosure process. Ancillary and analogue research on secrecy and disclosure are also reviewed. Implications for future research and practice are discussed.

How do children tell? The disclosure process in child sexual abuse. Bradley, April R.; Wood, James M.; Child Abuse & Neglect, Vol 20(9), Sep 1996. pp. 881-891.
Abstract: Examined children's disclosures of sexual abuse in 234 sexual abuse cases validated by Protective Services in Texas. Denial of abuse occurred in 6% of cases, and recantation in 4% of cases in which a child had already disclosed abuse. Four of the 8 victims who recanted appeared to do so in response to pressure from a caretaker. 72% had disclosed abuse to someone else prior to contact with Protective Services or the police. 96% made a partial or full disclosure of abuse during at least 1 interview with Protective Services or police. The child sexual abuse accommodation syndrome described by R. C. Summit (1983) seems to be infrequent among the types of cases seen by child protection agencies. Findings do not support the view that disclosure is a quasi-developmental process that follows sequential stages.

The characteristics of disclosure among children who may have been sexually abused. ***DeVoe***, Ellen R.; Faller, Kathleen Coulborn; Child Maltreatment, Vol 4(3), Aug 1999. pp. 217-227.
Abstract: Seventy-six 5-10 yr olds (47 females), who were referred because of concerns about sexual abuse, were interviewed as part of a larger study testing the efficacy of a computer-assisted interview in sexual abuse evaluations. Data from initial interviews were coded according to the presence of disclosure and the details revealed about sexual abuse. The presence and amount of corroboration were coded through case review. Although 56 children were coded as having disclosed prior to evaluation, only 44 subjects disclosed during the initial interview. Only 1 child disclosed spontaneously. An additional 8 children (11%) disclosed possible sexual abuse in a second or later interview. Although girls disclosed at a higher rate than boys, children did not differ in the amount or types of information they provided about alleged sexual abuse. Findings are discussed in terms of the conceptualization of disclosure as a process. Implications for interviewing strategies are addressed.

Children's disclosure of sexual abuse during formal investigation. Keary, Kay; Fitzpatrick, Carol; Child Abuse & Neglect, Vol 18(7), Jul 1994. pp. 543-548.

Abstract: 251 children who had full assessments over a 12-mo period were divided at time of referral into 2 groups, those who had previously told someone about abusive experiences prior to investigations and those who had not. There was a strong positive correlation between having previously told someone about sexual abuse and disclosure of such abuse during formal investigation. There was also a strong positive correlation between not having previously told someone and not disclosing during formal investigation. Age was an important variable, with children under 5 yrs being least likely to disclose abuse during formal investigation, irrespective of whether they had previously told someone about abuse. Disclosure of sexual abuse during investigation was strongly correlated with abuse being regarded as confirmed.

False negatives in sexual abuse interviews: Preliminary investigation of a relationship to dissociation. Chaffin, Mark; Lawson, Louanne; Selby, Abby; Journal of Child Sexual Abuse, Vol 6(3), 1997. Pp. 15-29.
Abstract: Examined 8-12.5 yr old female children who presented to a hospital emergency room with physical complaints which were later determined to be compelling evidence of sexual abuse. Cases were selected where there was no prior history, suspicion, or disclosure of abuse, and the child failed to disclose any sexual contact in the initial sexual abuse disclosure interview. These interview "false negatives" previously had been found to be related to caretaker biases against considering the possibility that abuse may have occurred. However, it was not clear what role, if any, individual psychological processes may have played in the false negative interviews. The present study re-located and assessed a small number of these children for dissociative and behavioral symptoms. Two non-contemporaneous comparison groups were used: (1) "true-positive" (i.e., disclosing) sexually abused children from the same hospital emergency room and (2) nonabused, non-psychiatric controls from the same hospital. False negative children were found to have significantly higher levels of dissociative symptoms, although they did not differ from true positives and non-abused controls on general behavioral problems. The results are consistent with an association between false negatives in sexual abuse interviews and dissociation.

Disclosure of Child Sexual Abuse: What Does the Research Tell Us About the Ways That Children Tell? London, Kamala; Bruck, Maggie; Ceci, Stephen J.; Psychology, Public Policy, and Law, Vol 11(1), Mar 2005. pp. 194-226.
Abstract: The empirical basis for the child sexual abuse accommodation syndrome (CSAAS), a theoretical model that posits that sexually abused children frequently display secrecy, tentative disclosures, and retractions of abuse statements was reviewed. Two data sources were evaluated: retrospective studies of adults' reports of having been abused as children and concurrent or chart-review studies of children undergoing evaluation or treatment for sexual abuse. The evidence indicates that the majority of abused children do not reveal abuse during childhood. However, the evidence fails to support the notion that denials, tentative disclosures, and recantations characterize the disclosure patterns of children with validated histories of sexual abuse. These results are discussed in terms of their implications governing the admissibility of expert testimony on CSAAS.

Disclosure, delay, and denial: In search of truth. Bradley, April R.; Rusinko, Holly M.; PsycCRITIQUES, Vol 53 (2), 2008.
Abstract: Reviews the book, Child sexual abuse: Disclosure, delay, and denial by Margaret-Ellen Pipe, Michael E. Lamb, Yael Orbach, and Ann-Christin Cederborg (Eds.) (see record 2007-06518-000). The book provides a comprehensive review of the literature in the area of abuse disclosure and includes an abundance of new research findings. The reviewers thought the editors compiled a well-organized book--one in which the overall structure of the book was easy to follow. They also thought the chapter authors did an excellent job emphasizing the complicated nature of this issue, and provided analyses of multiple research methodologies and conclusions. Several chapters report new research data related to various aspects of disclosure. The book concludes with chapters discussing policy implications of research on disclosure (delay and denial). For the reviewers, this section was especially helpful in synthesizing all of the information with recommendations for application in various settings. In their review, Bradley and Rusinko comment on the authors' discussions of: (1) clinical and forensic ramifications; (2) false memories and intentional deception; (3) reasons for non-disclosure; (4) interviewing techniques and protocols (including the National Institute of Child Health and Human Development investigative

interview protocol); (5) developmental issues; (6) behavioral correlates of abuse denial; and (7) evidence-based strategies. In summary, the reviewers believe this book offers one of the most comprehensive reviews of literature in this area and presents important new research findings. In their opinion, the book is a must read for anyone directly involved with victims of child sexual abuse.

Disclosure of child sexual abuse: For better or for worse. Sauzier, Maria; Psychiatric Clinics of North America, Vol 12(2), Jun 1989. pp. 455-469.
Abstract: Evaluated 156 sexually abused children (mean age 10.1 yrs). Ss received crisis intervention and were administered a standardized test battery. 55% of Ss disclosed their abuse most frequently to their mothers. Ss' ability to tell of the abuse was influenced by characteristics of the experience. The dynamics of the disclosure process are presented as important variables in the victim-to-patient process. 115 Ss were reevaluated at 18-mo follow-up. Most Ss showed a significant decrease in psychopathology and an increase in self-esteem. Most Ss also showed improvement on standardized tests, but some regretted their disclosure.

Delay in disclosure of childhood rape: Results from a national survey. Smith, Daniel W.; Letourneau, Elizabeth J.; Saunders, Benjamin E.; Child Abuse & Neglect, Vol 24(2), Feb 2000. pp. 273-287.
Abstract: Gathered representative data regarding the length of time women who were raped before age 18 delayed prior to disclosing such rapes, whom they disclosed to, and variables that predicted disclosure within 1 mo. Data were gathered from 3,220 Wave II respondents from the National Women's Study (H. S. Resnick et al, see record 1994-25706-001), a nationally representative telephone survey of women's experiences with trauma and mental health. Of these, 288 retrospectively reported at least 1 rape prior to their 18th birthday. Details of rape experiences were analyzed to identify predictors of disclosure within 1 mo. Fully 28% of child rape victims reported that they had never told anyone about their child rape prior to the research interview; 47% did not disclose for over 5 yrs post-rape. Close friends were the most common confidants. Younger age at the time of rape, family relationship with the perpetrator, and experiencing a series of rapes were associated with disclosure latencies longer than 1 mo; shorter delays were associated with stranger rapes. Logistic regression revealed that age at rape and knowing the perpetrator were independently predictive of delayed disclosure.

How children tell: The process of disclosure in child sexual abuse. Sorensen, Teena; Snow, Barbara; Child Welfare Journal, Vol 70(1), Jan-Feb 1991. pp. 3-15.
Abstract: Examined the disclosure process in 116 sexually abused children (aged 3-17 yrs) to show that the process typically proceeds from denial to tentative and active disclosure and that Ss often recant but later reaffirm. Most protocols for investigating child sexual abuse are geared for Ss in active disclosure, but a retrospective analysis of the Ss' records showed only 11% to be in active disclosure at the time of the initial interview. This suggests that a child's initial denial, failure to provide immediate detail, or recantation may result in the dismissal of a valid complaint. 79% of the Ss initially denied the abuse or were tentative in disclosing it. 74% of Ss disclosed accidentally, which may be age- and developmentally related in the case of Ss' sexualized behavior and inappropriate statements. Peers and educational programs often motivated disclosure.

Abuse of the Child Sexual Abuse Accommodation Syndrome. Summit, Roland C.; Journal of Child Sexual Abuse, Vol 1(4), 1992. pp. 153-163.
Abstract: Discusses the origins of the concept of the Child Sexual Abuse Accommodation Syndrome ([CSAAS] R. C. Summit; see record 1984-15274-001) and the subsequent distortions that court misuse has imposed. The CSAAS is a clinical observation that has become both elevated as gospel and denounced as dangerous pseudoscience. It is hoped that such a contextual review can serve as a guide toward a more accurate understanding among clinicians, judges, and advocate attorneys.

The child sexual abuse accommodation syndrome. Summit, Roland C.; Child Abuse & Neglect, Vol 7(2), 1983. pp. 177-193.
Abstract: Classifies the most typical reactions of children to sexual abuse into a child abuse accommodation syndrome. The syndrome is composed of 2 categories that define basic childhood vulnerability and 3 categories that are sequentially contingent on sexual assault: (1) secrecy; (2) helplessness; (3) entrapment and accommodation; (4) delayed, unconvincing disclosure; and (5)

retraction. The accommodation syndrome is proposed as a simple and logical model for use by clinicians to improve understanding and acceptance of the child's position in the complex and controversial dynamics of sexual victimization. Application of the syndrome tends to challenge entrenched myths and prejudice, providing credibility and advocacy for the child within the home and the courts and throughout the treatment process. The child's coping strategies as analogs for subsequent behavioral and psychological problems, including implications for specific modalities of treatment, are discussed.

TOPIC: The NICHD Standard

Toward a Better Way to Interview Child Victims of Sexual Abuse

Sara Harris, National Institute of Justice (nij.gov). NIJ Journal No. 267, Winter 2010, NCJ 233282

A study tests interview protocols in the hope of getting better case outcomes.

Child protection authorities substantiated 68,000 cases of child sexual abuse in 2008, according to the Department of Health and Human Services.[1] In many child sexual abuse cases, there is no witness other than the child and no corroborating evidence — the entire case can hang on a child's recollection of the alleged abuse. One way to help avoid false accusations and ensure justice in these cases is to strengthen law enforcement's ability to elicit accurate information from children. As the authors of the study discussed in this article note, "The quality of forensic interviewing practices is of utmost importance if child victims are to be protected, at the same time as the rights of the innocent suspects are to be upheld."[2]

We have gained considerable knowledge in the last two decades about child development, memory and cognition, and researchers have developed several techniques for improving the way child victims of sexual abuse are interviewed. One technique that showed promise in a laboratory has now been tested in the field in Utah's criminal justice system. The interview protocol was developed by the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD). The NICHD began developing its interview protocol in the 1990s. According to Margaret-Ellen Pipe, a member of the team that has developed and tested the protocol, "In the '80s people started recognizing children could provide reliable evidence. There had been real skepticism prior to that whether you would believe children."

In an NIJ-funded study, a team of researchers led by Pipe investigated how the NICHD protocol might affect prosecution outcomes. Their findings make it clear that the training and NICHD protocol elicit more information from possible victims. The findings cannot, of course, determine whether the information is more accurate — that is, the findings cannot definitively confirm details of what happened. But it is clear that after the protocol was introduced, prosecutors accepted more cases; and more cases that went to trial resulted in conviction than before the protocol was introduced.

The NICHD Protocol

The techniques employed by the NICHD protocol were designed to integrate advances in scientific understanding about memory and children's linguistic and cognitive development.

Over the years, various aspects of the NICHD protocol have been evaluated in the field. In fact, the authors note, the techniques developed under the auspices of the NICHD constitute the only protocol for forensic interviews with children to have been evaluated systematically. "The NICHD protocol has been researched in the field; that's what sets it apart," Pipe said.

Training in forensic interviewing techniques often increases interviewer knowledge without resulting in any meaningful change in how interviewers conduct the interviews.[3] NICHD training is effective in getting interviewers to use the new information learned. Studies testing the protocol have examined how best to train people in its use and, in particular, how to ensure that interviewers reliably acquire and actively use the new skills. Training can raise awareness, Pipe et al. note in their report, but it is important to guarantee that new techniques are adopted as a matter of practice. The NICHD training model promotes this by providing guidance and feedback for interviewers even after training has concluded.

The NICHD interview protocol includes three phases:

- Introductory
- Rapport-building
- Substantive or free recall

At the beginning of the conversation, the child and the interviewer discuss expectations and set ground rules: this is the introductory phase. Interviewers then ask children to talk about events unrelated to the suspected abuse; the idea is to encourage the child to be comfortable leading the conversation by developing this rapport. In this phase, the "child learns the conversational rules, because they are different from many conversations in which children take part," Pipe explained. Later, interviewers encourage children to recall the target incident and talk about it in a narrative stream, as opposed to answering directed questions about it, one after another. Evidence indicates open-ended prompts draw out more accurate information than ones that simply elicit a child's recognition. The techniques discourage suggestive leads or questions with yes/no or either/or answers: "Where were his clothes?" for example, is preferred over, "Were his clothes on the floor?"

Nearly a decade of research confirms that when interviewers follow the guidelines outlined in the NICHD protocol, children give both more and higher-quality information. Their narrative accounts reveal greater detail when the NICHD protocol is implemented.

How the Study Was Conducted

The study examined the outcomes of cases before and after police detectives were trained on the NICHD Investigative Interview Protocol. The 11 detectives in the study performed forensic interviews at the Salt Lake County Children's Justice Center (CJC), an arm of the Utah Attorney General's Office. They were all experienced in conducting child abuse investigations and child forensic interviews but had never been trained in the NICHD protocol. The detectives' NICHD training took place over several days, included both simulated and actual forensic interviews, and included ongoing contact and feedback from the trainers.

Researchers from the City University of New York, Cambridge University in England, the NICHD and the CJC examined 1,280 sexual abuse cases between 1994 and 2000 that were referred to authorities in Salt Lake County, Utah, and investigated by the 11 detectives. Of the total sample, these detectives conducted 551 interviews before receiving training on the NICHD protocol and 729 after they had implemented the protocol. The same detectives, prosecutors and judges who handled the cases were used throughout the study period.[4]

Among the cases of alleged abuse that the researchers reviewed, nearly 60 percent involved improper touching and 5 percent were characterized by exposure; penetration was alleged in 35 percent of the cases reviewed. Detectives interviewed children between the ages of 2 and 14 and then presented their evidence to the district attorney, who decided whether or not to prosecute.[5]

Impact of Using the Interview Protocol

Researchers compared the outcomes of the cases that used the interview protocol with cases that did not. They found that after local detectives adopted the NICHD interview protocol, the percentage of investigated cases in which the district attorney filed charges rose from 45 percent to over 54 percent. Furthermore, these cases held up as they progressed through the system.

Although the number of cases that went to trial was small — 30 of a total of 513 cases in which charges were filed — 94 percent of those prosecuted after implementation of the NICHD protocol resulted in conviction (16 of 17 cases), compared with 54 percent before its introduction (7 of 13 cases). In the majority of cases, both before and after the NICHD protocol was

implemented, a plea agreement was reached. Of those, 81 percent led to a guilty plea on one or more charges. See Table 1 for more details on case outcome.

Table 1. Case Outcome by Interview Type

	Pre-Protocol	Protocol
Total	**551**	**729**
Cases accepted for prosecution	198 (35.9%)	315 (43.2%)
Cases with plea agreements	160 (80.8%)	255 (81%)
Pled guilty	105 (53%)	177 (56.2%)
Reduced	52 (26.3%)	76 (24.1%)
Cases with charges dismissed	15 (7.5%)	36 (11.4%)
Cases that went to trial	13 (6.6%)	17 (5.4%)
Not guilty verdict	6 (3%)	1 (0.3%)
Guilty verdict	7 (3.5%)	16 (5.1%)

(Cases that were diverted or were active/had no outcome information available were omitted from this table.)

While the percentage of cases in which charges were filed increased for three of the four age groups after the protocol was implemented, the impact of the protocol was strongest in cases in which the children were between 7 and 9 years old. This age group accounted for approximately 26 percent of the pre-protocol and post-protocol samples (135 and 167 cases respectively). For children in this age group, the rate at which prosecutors filed charges rose from 42 percent before to 64 percent after detectives were trained.

Given the nature of testing an interview protocol in the field, results like those in this study cannot definitively determine whether or not a protocol elicits more complete or accurate information from children; there is usually no way for researchers to know with absolute certainty if the alleged sexual abuse occurred.

Previous studies have established that use of the NICHD protocol increases the amount of information children reported with little or no interviewer input, a core feature of the NICHD protocol. There is a significant body of research demonstrating that interview techniques emphasizing the use of open-ended prompts and other methods that encourage a child's free recall elicit more accurate details than more focused prompts — ultimately, the kind of details on which investigators build their case. These techniques have proven effective at getting better information from preschoolers, elementary school children and teenagers alike. The evidence-based nature of the NICHD protocol lends credence to the researchers' assertion that, when employed by well-trained interviewers, the protocol likely improves the detail and accuracy of information elicited from children in most age groups during forensic interviews and positively affects case outcome.

Notes

[1] U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau, *Child Maltreatment 2008* (pdf, 182 pages), Washington, DC: U.S. Government Printing Office, 2010.

[2] Pipe, M., Y. Orbach, M.Lamb, C. Abbott, and H. Stewart, *Do Best Practice Interviews with Child Sexual Abuse Victims Influence Case Outcomes?* (pdf, 123 pages), Final report for the National Institute of Justice, Washington, DC: National Institute of Justice, November 2008, NCJ 224524.

[3] Lamb, M., Y. Orbach, I. Hershkowitz, P. Esplin, and D. Horowitz, "Structured Forensic Interview Protocols Improve the Quality and Informativeness of Investigative Interviews with Children: A Review of Research Using the NICHD Investigative Interview Protocol," *Child Abuse & Neglect* 31 (2007): 1201-1231.

[4] The judges and prosecutors were likely aware that the detectives received new training on a forensic interview protocol.
[5] The study divided the children into four age groups: 2- to 4-year-olds; 5- to 6-year-olds; 7- to 9-year-olds; and 10- to 13-year-olds. The youngest child in the study was 2.80 years old; the oldest was 13.97 years old.

Research on NICHD

Assessing the value of structured protocols for forensic interviews of alleged child abuse victims.
Orbach, Yael, Hershkowitz, Irit, Lamb, Michael E., Esplin, Phillip W., Horowitz, Dvora. Child Abuse & Neglect, Vol 24(6), Jun, 2000. pp. 733-752.
Abstract:
Examined the effectiveness of the National Institute of Child Health and Human Development (NICHD) investigative protocol, a flexibly structured protocol incorporating a wide range of strategies believed to enhance retrieval with child witnesses. Six forensic investigators were trained to use the NICHD protocol while conducting feedback-monitored simulation interviews. The protocol's was evaluated by comparing 55 protocol interviews (PRIs) with 50 prior interviews by the same investigators, matched with respect to characteristics likely to affect the richness of the children's accounts. The comparison was based on analysis of investigators' utterance types, distribution, and timing, and quantitative and qualitative characteristics of information produced. PRIs contained more open-ended prompts than non-PRIs did. More details were obtained using open-ended invitations and fewer were obtained using focused questions in PRIs than in non-PRIs, although total number of details elicited did not differ significantly. In both conditions, older children provided more details than younger children did.

A structured forensic interview protocol improves the quality and informativeness of investigative interviews with children: A review of research using the NICHD Investigative Interview Protocol.
Lamb, Michael E., Orbach, Yael, Hershkowitz, Irit, Esplin, Phillip W., Horowitz, Dvora, Child Abuse & Neglect, Vol 31(11-12), Nov, 2007. pp. 1201-1231.
Abstract:
Objective: To show how the results of research on children's memory, communicative skills, social knowledge, and social tendencies can be translated into guidelines that improve the quality of forensic interviews of children. Method: We review studies designed to evaluate children's capacities as witnesses, explain the development of the structured NICHD Investigative Interview Protocol, and discuss studies designed to assess whether use of the Protocol enhances the quality of investigative interviews. Results: Controlled studies have repeatedly shown that the quality of interviewing reliably and dramatically improves when interviewers employ the NICHD Protocol. No other technique has been proven to be similarly effective. Conclusions: Use of the structured NICHD Protocol improves the quality of information obtained from alleged victims by investigators, thereby increasing the likelihood that interventions will be appropriate.

Review of 'A structured forensic interview protocol improves the quality and informativeness of investigative interviews with children: A review of research using the NICHD Investigative Interview Protocol'.
American Journal of Family Therapy, Vol 36(4), Jul-Sep, 2008. pp. 346-347.
Abstract:
Reviews the article, A structured forensic interview protocol improves the quality and informativeness of investigative interviews with children: A review of research using the NICHD Investigative Interview Protocol by M. E. Lamb, Y. Orbach, I. Hershkowitz, P. W. Esplin, and D. Horowitz (see record 2007-18380-006). This review paper aims to, "show how the results of research on children's memory, communicative skills, social knowledge, and social tendencies can be translated into guidelines that improve the quality of forensic interviews of children." The other primary purpose of the article was to describe and report on the utility of a new interview tool and training materials that were designed specifically with this research in mind. In reviewing the current knowledge base, the authors state that the most important issue is the, "interviewer's ability to elicit information and the child's willingness and ability to express it, rather than the child's ability to remember it." The paper also presents a summary of a series of studies conducted nationally and internationally in which the NICHD protocol was used.

Re: The development of forensic interview training models: A reply to Lamb, Orbach, Hershkowitz, Esplin, and Horowitz (2007).
Vieth, Victor, Child Abuse & Neglect, Vol 32(11), Nov, 2008. pp. 1003-1006.
Abstract:
Comments on an article by M.E. Lamb et al. (see record 2007-18380-006). The article contains several statements about the NICHD as well as the Finding Words forensic interviewing models that warrant clarification or elaboration. The authors properly note that the most effective forms of forensic interview training programs are those that "provide continued support, guidance, and feedback on interviewer behavior in interviews conducted after starting to use the Protocol." However, the authors incorrectly assert that "only the NICHD training model includes

feedback beyond the training period (i.e. in post-training investigative interviews as well)." The authors contend it is "well-established" that the NICHD protocol elicits "accounts that are more likely to be accurate and less likely to be challenged in court." The authors, however, do not provide any evidence that the NICHD protocol has met the rigorous legal standards for its admissibility in a court of law or that investigators using the model have been qualified as experts in a court of law on forensic interviewing issues. The authors' claim that drawings and dolls are "potentially risky tools," ignores the fact that the vast majority of research supports the usage of these tools provided they are properly used. Moreover, these tools are widely accepted in court. The authors recognize that NICHD is not a "panacea" and that more research needs to be done to assess whether the protocol assists in finding corroborating evidence and how it can be modified to address "special circumstances."

Authors' response to Vieth (2008): Legal and psychological support for the NICHD interviewing protocol.
Lyon, Thomas D., Lamb, Michael E., Myers, John, Child Abuse & Neglect, Vol 33(2), Feb, 2009. pp. 71-74.
Abstract:
Reply by the current authors to the comments made by Victor Vieth (see record 2008-17415-002) on the original article (see record 2007-18380-006). Vieth agreed with Lamb and colleagues that there is a "substantial degree of consensus regarding the ways in which investigative interviews should be conducted". It is indeed well accepted that interviewers should "introduce as little information as possible while encouraging children to provide as much information as possible in the form of narratives elicited using open-ended prompts ('Tell me what happened.')". Research has shown that among children disclosing abuse, "responses to individual free-recall prompts are three to five times more informative than responses to more focused prompts". Vieth did not question this research. Also, Vieth did not question the well-replicated finding that interviewers trained to use the NICHD Protocol use more open-ended prompts and reduce their use of more risky question-types, risky because they elicit less accurate information. He also agreed that improving the quality of forensic interviewing requires "continued support, guidance, and feedback on interviewer behavior", pointing to ways in which the Finding Words program encourages peer review of interviews.

TOPIC: Therapeutically Recovered Memories

Heavily edited from Raymond Phinney: "*Malleability of Memory: Evaluating Testimony and Accusations within the Mission Community*." (unpublished article as of 11/13).

The "encyclopedic knowledge" theory of memory leads laypersons to believe that amplifying or strengthening the memory system can improve accurate recall. But, if behavioral guidance is memory's function, and conscious knowledge only a side-effect, then "amplifying" the system might not restore accurate recall. Sadly, many therapists also indulge this folk theory of memory and its recovery. Both therapist and client then believe there is a detailed, accurate, record that is eminently recoverable in all its details. Any increase in recalled details after therapy begins is assumed to be accurate. As reviewed above, most sensory details were never encoded. Those that were encoded decayed faster than semantics. Storage was not static. And, the retrieval context powerful affects reconstruction. The extra details recalled are mostly inferred from known information, shaped by current context and goals, and involve suggestion and misinformation effects introduced by the therapist and the client's own motivations.

Therapeutic recovery of an accurate memory is thus dubious at best. All the memory enhancement techniques we know of are prospective, or require detailed contextual knowledge. To enhance a memory, attend very carefully as it happens, rehearse it often and deeply while verifying the information. Recall while in the same environment, state, mood, etc. as the original event. Repeat. Often. Sleep well. Unfortunately, these must all be done prospectively, planned out and performed as the processes of memory unfold.

After the fact, memory enhancement is quite difficult and always leads to some degree of distortion. In fact, evidence cited in support of accuracy in therapeutically recovered memory is overblown. These studies are typically methodologically weak and their "evidence" is often not interpretable solely as supporting the recovered memory. They also often use subjects who have freestanding memories.[36] There is now mounting evidence that many people who report having recovered a memory for the first time in therapy have actually recovered that memory numerous times in life and then forgotten it again. Any accuracy in these individual's memory is likely due to the same reasons spontaneously recovered and freestanding memories are more accurate than therapeutically recovered memory. Over the retention interval, there has been intermittent rehearsal.[37] The less the client remembers, the more influence the current context has. The therapist cannot know the details or the facts of the encoding context or the events independently of the client's own incomplete memory. She or he will ignorantly influence the recalled details with questions and even open-ended prompts. The differences between the original (encoding) context and the therapeutic (recall) context do not just result in a lack of context-dependent memory. One's recall is still context dependent, but the mismatch in contexts will bias recall. Since the therapist seldom has accurate information about the original events or contexts, they will certainly pollute the memory in the recovery attempt. The filling-in of information via reconstruction is automatic, similar to how one's blind spot is filled in on the retina. Neither the client nor the therapist will be able to determine which details, if any, are accurate.

Suggestion is rampant in such therapies. Recall can be biased extremely easily with post-event information that is only inferred from interview questions. Therefore, even a therapist with no agenda can exert a strong influence over the client's reconstruction processes as they piece together a recovered memory. Even a mild therapist agenda, such as a tentative belief that the client was possibly sexually abused and repressed those memories and that the perpetrator is likely a male relative or family friend, can powerfully affect the client's reconstruction process. Therapists who are convinced of the above scenario corrupt reconstruction even more so. Even what the therapist considered open-ended and inclusive questions can cause suggestion and

misinformation depending on the client's interpretation of the question, the wording, and the intent of the therapist. These effects are stronger for a longer retention interval, such as occurs with most memory recovery therapies. Also, as mentioned earlier, imagination inflation, misattribution, and misinformation effects get more powerful over repeated sessions of discussing the possible past events.[38]

A Logical Error
Many therapists who use memory recovery therapy follow this flawed logic.

Syllogism A
a) IF one was sexually abused as a child,
b) THEN one will have certain symptoms.
c) Those symptoms are present in this client.
d) THEREFORE, it is likely the client was sexually abused in the past, even if they do not remember it.

Clause (a) is the antecedent, and (b) is the consequent. In such conditional logic, the syllogism can properly yield the conclusion (d) only if (c) affirms the antecedent (a). However, note that (c) in Syllogism A actually affirms (b). This is a logical fallacy termed **"affirming the consequent**." Consider a different syllogism.

Syllogism B
a) IF Bob swam in the Stinky River,
b) THEN Bob will stink.
c) Bob stinks.
d) THEREFORE, Bob swam in the Stinky River.

Here too, (c) affirms (b) and thus (d) is not logically valid. Bob could stink from running, falling in the mud, or eating garlic. Just as one may stink without swimming in the Stinky River, there are other ways to have those symptoms (like suffering any trauma, not just sexual abuse). However, most people believe a syllogism based upon whether they think the conclusion is plausible or true, not based on sound logic. If the therapist suggests this line of reasoning, clients believe it is plausible. Accepting the logic as valid, they become even more likely to recall new details consistent with childhood sexual abuse.

Expertise
It was previously noted that one of the checks on inaccurate reconstruction is plausibility checking, informed by a person's beliefs about the world and about how memory works.[39] As the person recollects, they filter through their current world knowledge to see if the recollection conforms to how the world works. Once an expert, such as a licensed psychotherapist, tells the client it is possible to suffer sexual abuse and not remember, the client is much less likely to reject any thoughts about such a hypothetical event. When asked to think about and discuss any evidence that such a thing ever happened, likely they will remember more details that substantiate the suspicion the more they discuss it.[40]

Pattern Perception
Once the client buys the flawed logic and begins participating in guided imagery, hypnosis, journaling, dream interpretation, and such, they will begin remembering snippets of experience that might be sexual abuse. Any scary events that they remember but for which they have source amnesia, can now be grafted in to a growing abuse narrative. Both misattribution and suggestibility are helping form the narrative. In trying to reconstruct this event, all their pattern perception and plausibility mechanisms will automatically be at work. Most likely they will

eventually recover a memory of abuse at the hands of a plausible person. It will often be a close male with whom the client feels emotional distance or conflict and who was alone with them one or more times.

APA Working Group on Investigation of Memories of Childhood Abuse

The American Psychological Association Working Group on Investigation of Memories of Childhood Abuse rejects the idea that any symptom patter is an indicator of child sexual abuse. But they go further, noting:

> When clients report what they phenomenologically experience as memories of previously unrecollected trauma, therapists should take … steps to avoid imposing a particular version of reality on these experiences and to reduce risks of the creation of pseudomemories…. It is important to remember that the goal of therapy is not archeology; recollection of trauma is only helpful insofar as it is integrated in to a therapy emphasizing improvement of functioning.
>
> Therapists should carefully consider all alternative hypotheses, including that the retrieved material is (a) a reasonably accurate memory of real events; (b) a distorted memory of real events, with distortions due to developmental factors or source contaminations; (c) a confabulation emerging from underlying psychopathology or difficulties with reality testing; (d) a pseudomemory emerging from exposure to suggestions; or (e) a form of self-suggestion emerging from the client's internal suggestive mechanisms.[41]

Such an approach will limit the logical fallacy, and expertise influences warned of above.

Recovered Memory Therapy

Any therapeutic memory recovery that relies primarily on the client's memory or that of his or her allies, and does not early on include memories from person's with contrary viewpoints, public records, common sense, and fact checking, will tend toward distortion of the memory. Therapist-initiated therapy based on observed symptomology without freestanding memories of abuse is an egregious logical and clinical error that further encourages confabulation. It often leads to pseudomemories.

Receiving accusations based on therapeutically recovered memory

Memory is not a videotape of the past. Normal memory processes can include many types of distortion. Other evidence must corroborate any person's recall. However, therapeutic memory recovery is the perfect storm of distortion-maximizing influences. It can and has generated pseudomemories and distortion. These could include distortions of the perpetrator's identity, time and place of the event, and the exact nature of the event. Therapeutically recovered memories are more unreliable than freestanding memories, or spontaneously recovered memories.[42] Also, if the abuse was understood as sexual and traumatic, and the place it occurred and the offender were continuously present in the accuser's life, any recovered memory is less likely to be accurate, since those factors all make it forgetting the abuse in the first place highly unlikely. Further, discontinuous memories that were recovered all at once are more reliable than those recovered one detail at a time over an extended period.[43]

Use of remote memory in assessing accusations

Our everyday memory is usually accurate about the most important elements of a memory, but over time it can decay and details can be reconstructed allowing misattribution and suggestion effects. Other details can be lost through decay or blocking. Upon hearing of an accusation,…(*forensic investigators*)… should get as detailed a statement as possible while influencing that detail as little as possible. Use non-directive language.

(*forensic investigators should*)… Encourage the complainants to report what they saw, heard, felt, etc. Have them specify what they thought those perceptions meant and how they thought about it at the time and over time since then. Have them take their time and rewrite the statement to form a coherent, linear description of the events and the recall process. Only after confirming that the narrative is as complete and linear as the complainant thinks possible may questions be asked about internal inconsistencies. Thorough examination of the complaint and careful strategy in composing further questions should both ensue. Questions must be carefully constructed to limit the possibility of suggestion and misinformation effects. Any questions should mainly center on clarifying the complaint and resolving any ambiguity in the story. Avoid giving information not supplied, or suggesting things not alleged. The process should include asking for the complainant's medical, mental health, and therapeutic history. The questions should be broad enough to include not only psychotherapists but also pastors, survivor groups, and self-help workbooks about psychology or trauma. Ascertain as clearly as possible whether the complainants memories were freestanding or discontinuous. If discontinuous, how did recovery occur? Was it in therapy or spontaneously? Was recovery fairly quick, in an all-at-once fashion, or did it take months or years for details to emerge? If they did undergo memory recovery therapy, it is important to ascertain whether the therapist ever committed the logical errors concerning symptomology, or exerted other undue influence on reconstruction, if possible. The entire deposition and question and answer process should be recorded for later review, to assess whether any suggestions were planted in the process.

Remember that vivid, detailed, memories are not more accurate than other memories. There is no property of the memory that can tell indicate if it is false. Peudomemories have been shown to persist for a long time, contain great detail, evoke emotional response, and affect behaviors such as food preferences, etc., just as real memories do

After obtaining a full statement, …(*forensic investigators*)…should assess the complaint by seeking corroboration and disconfirmation. It may be helpful to appoint different persons or subcommittees to seek corroborative versus disconfirming evidence. This may limit confirmation bias, in which seeking corroboration can blind one to disconfirming evidence and seeking disconfirmation can blind one to corroboration.

It is often thought that a measure of the complainant's (and the accused's) credibility can be helpful in determining the accuracy of the complaint. This arm of the investigation may be of some use. But, it should be noted that many abused persons may be disordered enough to seem unreliable, such as having a drug addiction or other maladaptive life habits. They may have time confusion and have difficulty sorting out the timeline. Considering long past events where not much is discoverable, it is tempting to look at the complaint itself to determine its accuracy. There is no known property of the memory itself which can differentiate a genuine memory from a pseudomemory.[44] No differences in detail, emotion,[45] durability,[46] or effect on behavior[47] have been observed. However, if the memory was discontinuous, there are properties of the recovery and circumstances recalled that may help determine whether the memory is more likely to be accurate.[48] If the accuser perceived the abuse as traumatic or sexual at the time it occurred, it is unlikely that it would have been forgotten (remember persistence). Therefore it is more likely a false memory. If it was spontaneously recalled by encountering reminders in everyday life it is more likely a genuine memory than if the details came back slowly over a period of time, especially if undergoing suggestive memory recovery therapy. Of course this only applies if the offender and the location of the abuse were not still present in the accuser's life (as constant reminders) after the abuse. These conditions, however, do not guarantee accuracy or falsehood, they only inform whether the memory is more likely to be true or false…

Conclusion

Accusations of misconduct, especially concerning sexual abuse, must be taken very seriously. Care must be taken to limit likelihood of introducing memory distortions or pseudomemories in the

deposition process. Care must also be exercised not to accept false memories as true. Continuous memories are least likely to be distorted or inaccurate. Discontinuous memories that were recovered all-at-once, concerning abuse that was not understood as traumatic or sexual at the time, are least likely to be falsely recovered. All memories must be corroborated, since reconstruction allows for the possibility of suggestion, misinformation, and other distortions.

References

[36] The following is an example study including people with freestanding memories and very low standards for corroboration. Judith L. Herman and Emily Schatzow, "Recovery and Verification of Memories of Childhood Sexual Trauma," *Psychoanalytic Psychology* 4, no. 1 (1987): 1–14, doi:10.1037/h0079126.

[37] Elke Geraerts et al., "Forgetting of Prior Remembering in Persons Reporting Recovered Memories of Childhood Sexual Abuse.," *Psychological Science* 17, no. 11 (November 2006): 1002–8, doi:10.1111/j.1467-9280.2006.01819.x.

[38] French, Sutherland, and Garry, "Discussion Affects Memory for True and False Childhood Events"; Heaps and Nash, "Comparing Recollective Experience in True and False Autobiographical Memories."; Sharman, Manning, and Garry, "Explain This: Explaining Childhood Events Inflates Confidence for Those Events."

[39] J T O'Sullivan and M L Howe, "Metamemory and Memory Construction," *Consciousness and Cognition* 4, no. 1 (March 1995): 104–110, doi:10.1006/ccog.1995.1011.

[40] French, Sutherland, and Garry, "Discussion Affects Memory for True and False Childhood Events"; Heaps and Nash, "Comparing Recollective Experience in True and False Autobiographical Memories."; Sharman, Manning, and Garry, "Explain This: Explaining Childhood Events Inflates Confidence for Those Events."

[41] Judith L. Alpert et al., "Final Conclusions of the American Psychological Association Working Group on Investigation of Memories of Child Abuse.," *Psychology, Public Policy, and Law* 4, no. 4 (1998): 933–940, doi:10.1037//1076-8971.4.4.933.

[42] Elke Geraerts, Linsey Raymaekers, and Harald Merckelbach, "Recovered Memories of Childhood Sexual Abuse: Current Findings and Their Legal Implications," *Legal and Criminological Psychology* 13, no. 2 (September 24, 2008): 165–176, doi:10.1348/135532508X298559; Elke Geraerts et al., "The Reality of Recovered Memories," *Psychological Science* 18, no. 7 (2007): 564–569.

[43] Richard J McNally and Elke Geraerts, "A New Solution to the Recovered Memory Debate," *Perspectives on Psychological Science* 4, no. 2 (2009): 126–134.

[44] Daniel M. Bernstein and Elizabeth F. Loftus, "How to Tell If a Particular Memory Is True or False," *Perspectives on Psychological Science* 4, no. 4 (July 2009): 370–374, doi:10.1111/j.1745-6924.2009.01140.x.

[45] Cara Laney and Elizabeth F Loftus, "Emotional Content of True and False Memories.," *Memory* 16, no. 5 (January 2008): 500–16, doi:10.1080/09658210802065939.

[46] Cara Laney et al., "The Persistence of False Beliefs.," *Acta Psychologica* 129, no. 1 (September 2008): 190–7, doi:10.1016/j.actpsy.2008.05.010; Bi Zhu et al., "Brief Exposure to Misinformation Can Lead to Long-Term False Memories," *Applied Cognitive Psychology* 26 (2012): 301–307; Elke Geraerts et al., "Lasting False Beliefs and Their Behavioral Consequences.," *Psychological Science* 19, no. 8 (August 2008): 749–53, doi:10.1111/j.1467-9280.2008.02151.x.

[47] Cara Laney et al., "Asparagus, a Love Story," *Experimental Psychology (formerly "Zeitschrift Für Experimentelle Psychologie")* 55, no. 5 (January 1, 2008): 291–300, doi:10.1027/1618-3169.55.5.291; Daniel M Bernstein et al., "False Beliefs About Fattening Foods Can Have Healthy Consequences False Memories : A Primer," *Proceedings of the National Academy of Sciences of the United States of America* 102, no. 39 (2005): 13724–13731.

[48] McNally and Geraerts, "A New Solution to the Recovered Memory Debate."

TOPIC: Cross Race Effects

The following text borrows extensively from Wikipedia, which offers a helpful synopsis of ***cross-race effects***.

The **cross-race effect** (sometimes called **cross-race bias**, **other-race bias** or **own-race bias**) refers to our tendency to more easily recognize members of our own race. A study was made which examined 271 real court cases. The results from this study showed that witnesses correctly identified 65% of the defendants which were of the same race as them. On the other hand, 45% of the defendants were identified which belonged to a different race than the witnesses.[1]

In social psychology, the cross-race effect is described as the "ingroup advantage". In other fields, the effect can be seen as a specific form of the "ingroup advantage" since it is only applied in interracial or inter-ethnic situations, whereas "ingroup advantage" can refer to mono-ethnic situations as well.[2]

Deeper study of the cross-race effect has also demonstrated two types of processing for the recognition of faces: *featural* and *holistic*. It has been found that holistic processing (which occurs beyond individual parts of the face) is more commonly used in same-race situations, but there is an experience effect, which means that as a person gains more experience with those of a particular race, he or she will begin to use more holistic processing. Featural processing is much more commonly used with an unfamiliar stimulus or face.[3]

Theoretical approaches

"How To Spot A Jap" (1942), produced by the United States Army, attempts to describe the visual differences between Japanese and Chinese, a distinction that was difficult for US soldiers.

History

The first research on the cross-race effect was published in 1914.[4] It stated that humans tend to perceive people of other races than themselves to all look alike. All else being equal, individuals of a given race are distinguishable from each other in proportion to their familiarity or contact with the race as a whole. Thus, to the uninitiated Caucasian, all East Asian people look alike, while to East Asian people, all Caucasian people look alike. This does not hold true when people of different races familiarize themselves with races different from their own.

Ingroup advantage

Cross-race effect has a strong connection with the ingroup advantage phenomenon. With ingroup advantage, people evaluate and judge members of their own self-defined group as being better and fairer than members of other groups (outgroup disadvantage). Social psychologists have demonstrated in the last 30 years that even the smallest aspect of differentiation, like preference for flavor of ice cream or style of music, can trigger ingroup advantage. If the group-building factor is a person's race, then cross-race effect appears. The favoritism of ingroup members also results from the decreased inborn motivation to read the face of a person of another group or culture. Hess, Senecal & Kirouac[5] showed in 1996 that the motivation to decode the emotional facial expression instantly decreased when the experimental subject realized that the face belonged to a person of another race.

Cross-race effect and emotion recognition

A meta-analysis of several studies about emotion recognition in facial expressions revealed that people could recognize and interpret the emotional facial expression of a person of their own race faster and better than of a person of another race. These findings apply to all races in the same way.[6] Some studies show that other races, compared to one's own race, have differently shaped faces and different details within a facial expression, making it difficult for members of

other races to decode emotional expressions.[7][8] However, studies have shown that the mood of the observer does not affect the cross-race effect.[9]

Social cognition

Research has shown that people tend to think more categorically about outgroup members and more individually about ingroup members.[10] For example, outgroup members may associate specific facial features with a particular race or ethnicity, and do not notice the subtle variations in skin tone, eye color, or hair texture that ingroup members recognize. Categorical thinking happens more consistently for outgroup participants while individuation does the exact opposite.[10] These different views between outgroup and ingroup members have been known to bias conceptual cognitive processes and show that the cross-race effect actually has less to do with race than with different levels of cognitive processing that occur for ingroup and outgroup members.[10]

Cognitive disregard

Another set of cognitive theories related to cross-race effect focuses on how social categorization and individuation biases face memory.[10] Some researchers believe that the inability for ingroup members' to recognize differences in the features of outgroup members can be explained through cognitive disregard.[8] They find that the likelihood of falsely identifying a member of an out-group stems from an automatic encoding of a face without processing its unique features.[8] Thus, when presented with an out-group member who has a similar face to the one that was encoded, the in-group member automatically, but incorrectly determines that the face has been "seen" before.[8] These studies conclude that diminishing the cross race effect requires individuals to process ethnically-differing faces with the goal of encoding with individuation.[8]

Depth of processing hypothesis

Depth of processing also influences the presence of the cross race effect.[11] Same-race faces are more correctly and easily discerned because deep processing, than other-race faces are.[11] This hypothesis, however, is controversial because of its inability to be replicated within studies.[11]

Challenges for social cognition models

There are two challenges to the social cognition models (a) mixed evidence dealing with race accessibility, face perception, and memory and (b) the effects of development and training on the cross-race effect.[10] Regarding the mixed evidence, the popular belief is that the more someone is exposed to people of different races the less likely they will be affected by the cross-race effect.[10] There have been studies that support this theory, but other research has shown mixed results.[10] For example, the results of studies done where the accessibility, as in how easy or not it is for a person to be around people of difference races, to different races is manipulated, showed that this does not always affect face memory.[10] Second regarding the development and training effects, just because someone shows improvement with dealing with the cross-race effect due to exposure to cross race training or experience, it is not a direct prediction of a good social cognitive model.[10] For the social cognitive model to start explaining such effects there would have to be evidence that ingroup and outgroup distinctions occur developmentally at the exact time the cross-race effect emerges in a child.[10] There is some evidence showing when the cross-race effect first emerges, but there is little research directly testing the onset of ingroup and outgroup recognition biases in young children.[10]

Perceptual expertise hypothesis

The perceptual expertise hypothesis suggests that people recognize emotions in people of the same race with greater accuracy because individuals tend to gather as friends and spend more

time with people of the same race than people of a different race. With greater exposure comes greater expertise and ability to identify emotions of people in the same racial group.

Elfenbein and Ambady's meta-analysis[12] from the year 2002 uses the term "cultural emotional learning" to refer to this perceptual expertise hypothesis. The authors suggest that the more time spent with members of different races, the more familiar one is with different races, and the more cross-race effect is diminished. Important factors of the learning process are the duration and frequency of exposure and the motivation of the trainee. The brain automatically learns to process the information better and more accurately.[8][13]

Similarly, one may point to a study by Paul Ekman,[14] who is more known for his studies on microexpressions. Ekman und Friesen observed in 1976 that only contact with a foreign race raises the recognition rate of facial expressions. They showed pictures of white Americans to a tribe in New Guinea. The Americans either smiled, looked sad or angry. The members of the tribe who had been exposed to foreigners before could read the emotions in the American faces much better than those who had not.

The perceptual expertise theory also suggest that if we identify the perceptual learning mechanisms that control perceptual expertise with face and non-face stimuli we will understand the cross-race effect.[10] There are many models that deal with perceptual expertise, but all of these models share the idea that a human's face processing ability does not generalize equally to all faces.[10] Hence, these theories propose that racial segregation results in people developing better expertise in distinguishing between faces of our own race or of a different race.[10] Research around these theories also suggests that the more a child is exposed to cross-race face processing the lower the cross-race effect.[10] However, if the child is not exposed to a lot of cross-race face processing the cross-race effect can increase.[10] Furthermore, there is evidence that long term and short term exposure to cross-race face processing can improve recognition.[10]

Challenges for perceptual expertise models

Challenges to the perceptual expertise models are the mixed evidence for the interracial contact hypothesis, and the varied results of the training effect.[10] The mixed evidence shows that although there is some support to the theory that the more interracial contact a person has the, the better a person is at cross-race recognition, all the evidence gathered does not come to the same conclusion.[10] This mixture of results causes the relationship between cross-race exposure and recognition ability to weaken.[10] However, there may also be a third factor that contributes to these inconsistent findings.[10] There is some evidence that the quality of cross-race contact has an effect on this relationship.[10] For example, research supports the position that to be able to recognize cross-race faces one has to be attentive and effortful when encoding the face into memory.[10] Training individuals has been shown to reduce the cross race effect in people, however this quick onset is coupled with a quick off set of the ability.[10] Although, this short term training can translate into long term training, it is not the same as actually having real life experience with the cross-race effect.[10] Finally, there are also other processes besides perceptual expertise that can influence cross-race recognition.[10]

Effects of social cognition

Another reason the cross-race-effect may occur is that perceptions are often affected by motivations, expectations, and social cognition. Overall, the creation of norms has shaped and biased even simple perceptions such as line lengths. In terms of perception of faces, studies have shown that racially ambiguous faces that have been identified as one race or another based on their hairstyle are identified as having more features of the racial category represented by the

hairstyle. Similarly, faces of an ambiguous but equal shade are interpreted as darker or lighter when accompanied by the label of either "black" or "white", respectively.[15]

Integration of cross-race effect theories

Prototypes

Individuals develop and store a face prototype each time they encounter a face unique to ones he or she has previously encountered (usually ones that differ in features compared to his or her ethnic group).[8] From their studies, researchers have concluded that when an individual belonging to an ethnicity that differs from his or her own, he or she forms a prototype and reserves it for future use, if and when necessary.[8] The prototype view raises concern, however, because individuals storing these unique faces may ignore the fact that everyone has features that may be only special to his or her makeup, and may not apply to everyone belonging to that particular ethnic group or race; thus, this results in more false alarms during eyewitness testimony or identifying perpetrators in lineups.[8]

Race-feature theory

In his 1996 study, researchers noticed that when looking at ethnicity, in-group faces are processed without acknowledgement of ethnic-specific details and features.[8] People code faces that deviate from the norm of their ethnic group through the absence or presence of distinctive ethnic features.[8]

This is supported by the finding that the classification of other-race faces tends to be faster than same-race faces. This suggests that race seems to be a more perceptually salient feature than other more discerning facial features when the face belongs to a different race.[16] This was previously explained as stemming from a more clustered density-gradient for other-race faces than same race faces.[17] The reasoning is that this causes more nodes to become activated in reaction to an other-race face, resulting in faster classification, but less discriminability in terms of memory. However, these exemplar-based theories cannot explain why faces that are ambiguous in terms of social category information can influence recognition.

Contact hypothesis theory

One method researchers have suggested to help mollify the prevelence of the cross race effect is through application of the contact hypothesis. Accurate recognition and identification of other-race faces, researchers have deduced, stems from a difference in learning experiences that relate to individual ethnic groups.[18] The cross race effect can be reduced by continual exposure ethnic groups that differ from one's own; the more positive interactions that occur between two ethnic groups, the more heterogeneous the ethnicities will seem to be.[18] The type of contact experienced between the two ethnic groups also plays a major role in this hypothesis' effectiveness; the more intimate the contact, the higher the chances become of accurately recognizing a member of a different ethnicity than one's own[18]

Empirical findings

The cross-race effect across ethnic groups

Although most studies done about the cross race effect are with black and white participants, there are also numerous studies done with people of different ethnic backgrounds.[19] For example, there are studies done that compare Hispanic with black and white participants, black with white and Japanese participants, Chinese with Korean and white participants, Turkish and German participants, and finally a study has been done comparing Arab and Israeli Jews.[19] The data from all of these studies have come to the same conclusion. The cross-race effect is evident among all people of all different races.[19]

Morphological basis

The cross race effect has a morphological basis: The facial appearance is morphologically different for different ethnic backgrounds. This was established empirically in,[20] where a large set of 3D scans of faces from different ethnic backgrounds was automatically clustered into groups. Only facial landmark distances were used in this grouping. The result was that gender, as well as ethnicity, emerged as primary factors of group membership.

Immersion vs. Upbringing

Children and face identification

With the help of several conducted studies, researchers conclude that the accuracy of eyewitness memory is significantly affected by the ethnic identity of both the suspect and the eye-witness; an individual can more accurately recognize a face belonging to his or her race than an individual whose race differs from that of his or her own.[21] Previous studies have analyzed how the cross-race effect affects adults during eyewitness testimony but fails to address the possible existence of age-related confounding factors: On one hand, as an individual grows older and encounters more members of the other ethnic group in question, the novelty of the ethnic difference wears off and makes it less distracting, and the individual can pay higher absolute and relative amounts of attention to subtle distinctions between members of that group; on the other hand, time also increases the individual's exposure to biases prevalent in his/her own in-group, as well as compounding the effects of any self-reinforcement bias that the individual exhibits with respect to his/her preexisting opinions.[21] The literature available on this topic is minute and conflicting; some researchers have found a prevalence of the cross-race effect in both white and black children,[21] yet others have reported findings of children possessing the ability to discern other-race faces accurately.[21] In their aim to identify developmental differences, researchers such as Pezdek et al.[21] discovered that children recognize faces belonging to their own race more effectively than faces belonging to another race.[21]

Consequences

Cross-race identification bias

This effect refers to the decreased ability of people of one race to recognize faces and facial expressions of people of another race. This differs from the cross-race bias because this effect is found mostly during eyewitness identification as well as identification of a suspect in a line-up. In these situations, many people feel as if races other than their own look alike, and they have difficulty distinguishing between members of different ethnic groups. Cross-race identification bias is also known as the misinformation effect since people are considered to be misinformed about other races and have difficulty identifying them. In a study dealing with eyewitness testimony, investigators examined forty participants in a racially diverse area of the US. Participants watched a video of a property crime being committed, then in the next 24 hours came to pick the suspect out of a photo line-up. Most of the participants in the study either misidentified the suspect or stated the suspect was not in the line-up at all. Correct identification of the suspect occurred more often when the eyewitness and the suspect were of the same race.[22] In another study, 86 convenience store clerks were asked to identify three customers: one white, one black, and one Mexican, all of whom had purchased in the store earlier that day. The clerks tended to identify customers belonging to their own race accurately, but were more likely to make errors when attempting to identify other races members.[23] Meanwhile, another study found that "alcohol intoxication reduces the own-race bias in face recognition," albeit by impairing accurate perception and leaving in place or increasing random error rather than by improving facial recognition of members of other groups.[24]

There has been some disagreement about the consistency of the own-race bias. However, data gathered from multiple studies does show that the own-race bias is consistent.[25] The own-race bias occurs in people of all races.[25] Since eyewitness identification can be problematic, researches have started to conduct studies of own-race biases using more forensics.[25] This kind of research needs to pay more attention to a target's distinctive features and level of attractiveness.[25] If a target is very distinctive or very attractive, it could reduce the cross-race effect because that person would be easier to identify.[25]

Psychological experts all agree that the cross-race effect is a common occurrence during in-court testimony when an eyewitness is trying to remember a person.[26] In order to reduce the cross-race effect there have been multiple changes to how policemen handle eyewitness identification.[27] For example, to reduce the cross-race identification bias Britain has a law that states police must include the suspect in a line up with at least eight other people who share similar characteristics to him or her.[27] This forces the eyewitness to use his or her memory of the suspects features, not the suspect's race, as a form of identification.[27]

Economic

In a globalized world, in which different cultures and races collaborate and negotiate about contracts, licenses, rights and political decisions, one clearly sees the negative impacts of the cross-race effect. Prof. Thomas (Department of Intercultural Communication, Regensburg, Germany) stated that at least 50% of Western-Chinese negotiations fail due to impaired communication. Even signed contracts lead to suboptimal results in 60–70% of the cases. "Trends in Managing Mobility 2007"[28] found that 30% of the failed negotiations could be indirectly traced back to the cross-race effect. Consequences of the cross-race effect include reduced emotional intelligence, negative evaluation of trustworthiness, reduced ability to communicate, lack of empathy and a decreased ability to judge the overall situation of a negotiation.

Ways to reduce cross-race effect

A study was done in which participants were forewarned about cross-race effect and the idea that viewing individuals holistically according to stereotypes does not lead to the correct identification of facial expressions. Instead, participants were encouraged to focus on individual facial features. Results from this study showed that the cross-race effect could be reduced and sometimes even eliminated when participants were wary of it. Therefore, cross-race effect may be a result of people using stereotypes to holistically process faces rather than analytically view individual parts of faces to identify an emotion. This study also shows the effect that education may have in helping society as a whole to reduce the cross-race effect. When individuals are more aware of how they may be falling into the trap of stereotyping, they can make more accurate judgments about others.[29]

References

1. Michael Eysenck, Mark T. Keane, (September 2013). Cognitive Psychology. Psychology Press, p.309.
2. M. Beaupre (2006): An Ingroup Advantage for Confidence in Emotion Recognition Judgments: The Moderating Effect of Familiarity With the Expressions of Outgroup Members. *Personality and Social Psychology Bulletin*, Band 32(1), S. 16-26.
3. Tanaka, J. W., Kiefer, M., & Bukach, C. M. (2003). A holistic account of the own-race effect in face recognition: evidence from a cross-cultural stud. Elsevier.
4. Feingold CA (1914). The influence of environment on identification of persons and things. *Journal of Criminal Law and Police Science* 5:39–51.
5. Hess, U.; Kappas, A.; Bause, R. (1995): The intensity of facial expression is determined by underlying affective states and social situations. *Journal of Personality and Social Psychology*, Band 69(2), S. 280-288
6. Elfenbein, H.A. & Ambidi, N. (2002): On the universality and cultural specificity of emotion recognition: A meta-analysis. *Psychological Bulletin*, Band 128(2), S. 203-235

7. Anthony, T.; Cooper, C. & Mullen, B. (1992): Cross-racial facial identification: A social cognitive integration. *Personality and Social Psychology Bulletin*, Band 18, S. 296–301
8. Sporer, S.L. (2001a): Recognizing Faces of Other Ethnic Groups. *Public Policy, and Law*, Band 7(1), S. 36-97.
9. Teitelbaum, S.; Geiselman, R. E. (1 January 1997). "Observer Mood and Cross-Racial Recognition of Faces". *Journal of Cross-Cultural Psychology* 28 (1): 93–106.
10. Young, S. G.; Hugenberg, K.; Bernstein, M. J.; Sacco, D. F. (30 August 2011). "Perception and Motivation in Face Recognition: A Critical Review of Theories of the Cross-Race Effect". *Personality and Social Psychology Review* 16 (2): 116–142.
11. Meissner, Christian A.; Brigham, John C.; Butz, David A. (1 July 2005). "Memory for own- and other-race faces: a dual-process approach". *Applied Cognitive Psychology* 19 (5): 545–567.
12. Elfenbein, H. A. & Ambady, N. (2003). When familiarity breeds accuracy: Cultural exposure and facial emotion recognition. *Journal of Personality and Social Psychology*. Vol. 85(2), 276-290
13. Sporer, S.L. (2001b): The Cross-Race Effect. *Psychology, Public Policy, and Law*, Band 7(1), S. 170-200
14. Ekman and Friesen, 1976 P. Ekman and W. Friesen, Pictures of facial affect, *Consulting Psychologists Press*, Palo Alto, CA (1976).
15. Corneille, O., Potter, T., Hugenberg, K. (2007). Applying the attractor field model to social cognition: perceptual discrimination is facilitated, but memory is impaired for faces displaying evaluatively congruent expressions. *Journal of Personality and Social Psychology*. Vol. 93(3), 335-352.
16. Levin, D. T. (1996). Classifying faces by race. The structure of face categories. Journal of Experimental Psychology: Learning, Memory, & Cognition, 22, 1364–1382.
17. Valentine, T., & Endo, M. (1992). Towards an exemplar model of face processing: The effects of race and distinctiveness. Quarterly Journal of Experimental Psychology, 44A, 671-703.
18. Combs, G. M.; Griffith, J. (1 September 2007). "An Examination of Interracial Contact:The Influence of Cross-Race Interpersonal Efficacy and Affect Regulation". *Human Resource Development Review* **6** (3): 222–244.
19. *Handbook of eyewitness psychology*. Mahwah, NJ [u.a.]: Erlbaum. 2007. pp.257–81.
20. Salah, Albert Ali; Alyüz, Neşe; Akarun, Lale (2008). "Registration of 3D Face Scans with Average Face Models". *Journal of Electronic Imaging*. 17(1): 011006.
21. Pezdek, Kathy; Blandon-Gitlin, Iris; Moore, Catherine (1 January 2003). "Children's face recognition memory: More evidence for the cross-race effect.". *Journal of Applied Psychology* **88** (4): 760–763.
22. Josephson, S. & Holmes, M. (2008). Cross-race recognition deficit and visual attention: do they all look (at faces) alike?. *Proceeding ETRA '08 Proceedings of the 2008 symposium on Eye tracking research & applications.* ACM New York, NY, USA.
23. Platz, S. J., & Hosch, H. M. (1988). "Cross-Racial/Ethnic Eyewitness Identification: A Field Study." *Journal of Applied Social Psychology*, 18 (11), 972-984.
24. Hilliar, K.,Kemp, R.,Denson,T. (2010) "Now Everyone Looks The Same: Alcohol Intoxication Reduces The Own-Race Bias in Face Recognition." *Law and Human Behavior* Vol. 34(5), 367-368.
25. Bothwell, R. K.; Brigham, J. C.; Malpass, R. S. (1 March 1989). "Cross-Racial Identification". *Personality and Social Psychology Bulletin* **15** (1): 19–25.
26. Sporer, Siegfried Ludwig (1 January 2001). "The cross-race effect: Beyond recognition of faces in the laboratory.". *Psychology, Public Policy, and Law* **7** (1): 170–200.
27. Revlin, Russell (2007). *Human Cognition : Theory and Practice*. New York, NY: Worth Pub. pp.110–11.
28. ECA International (2007): *Trends in Managing Mobility 2007*
29. Hugenberg, K., Miller, J., Claypool, H. M., (2007). Categorization and individuation in the cross-race recognition deficit: Toward a solution to an insidious problem. *Journal of Experimental Social Psychology*. Vol. 43, 334 - 340.

Dr. Simpson recommends the following book chapters and research articles

Brigham, J. C., Bennett, L. B., Meissner, C. A., & Mitchell, T. L. (2007). **The Influence of Race on Eyewitness Memory**. In R.C.L. Lindsay, D. F. Ross, J. D. Read, & M. P. Toglia (Eds.), *The Handbook of Eyewitness Psychology: Memory for People* (pp. 257–281). Mahwah, NJ: Lawrence Erlbaum Associates.

Research Articles

Shriver, E. R., Young, S. G., Hugenberg, K., Bernstein, M. J., & Lanter, J. R. (2008). **Class, race, and the face: Social context modulates the cross-race effect in face recognition.** *Personality and Social Psychology Bulletin, 34*(2): 260-274.

Abstract
The current research investigates the hypothesis that the well-established cross-race effect (CRE; better recognition for same-race than for cross-race faces) is due to social-cognitive mechanisms rather than to differential perceptual expertise with same-race and cross-race faces. Across three experiments, the social context in which faces are presented has a direct influence on the CRE. In the first two experiments, middle-class White perceivers show superior recognition for same-race White faces presented in wealthy but not in impoverished contexts. The second experiment indicates this effect is due to the tendency to categorize White faces in impoverished contexts as outgroup members (e.g., "poor Whites"). In the third experiment, this effect is replicated using different ingroup and outgroup categorizations (university affiliation), with ingroup White faces being recognized better than outgroup White faces. In line with a social-cognitive model of the CRE, context had no influence on recognition for cross-race Black faces across the three experiments.

Pauker, K., Ambady, N. (March 2009). **Multiracial Faces: How Categorization Affects Memory at the Boundaries of Race. Journal of Social Issues,** Volume 65, Issue 1, pages 69–86.
Abstract
Monoracial and multiracial individuals are likely to have different conceptualizations of race and subsequently different approaches toward racial ambiguity. In particular, monoracial individuals may be more likely to rely on categories when processing ambiguous faces, whereas multiracial individuals may tend to ignore such categorizations due to a reduced tendency to essentialize race. We compared monoracial (White and Asian) and biracial (Asian/White) individuals' memory patterns. Specifically, we examined participants' memory for White, Asian, and biracial faces labelled as either White or Asian. Both White and Asian participants relied on the labels, remembering faces labeled as the in-group better than faces labeled as the out-group. Biracial participants relied less on the labels, exhibiting better recognition memory overall. Biracial participants' memory performance was also highly correlated with a less essentialist view of human traits. This cognitive flexibility may serve an adaptive function for biracial individuals and contribute to enhanced facial recognition.

Herzmann, G., Willenbockel, V., Tanaka, J. W., & Curran, T. (2011). **The neural correlates of memory encoding and recognition for own-race and other-race faces**. *Neuropsychologia, 49*(11): 3103-3115.
Abstract
People are generally better at recognizing faces from their own race than from a different race, as has been shown in numerous behavioral studies. Here we use event-related potentials (ERPs) to investigate how differences between own-race and other-race faces influence the neural correlates of memory encoding and recognition. ERPs of Asian and Caucasian participants were recorded during the study and test phases of a Remember-Know paradigm with Chinese and Caucasian faces. A behavioral other-race effect was apparent in both groups, neither of which recognized other-race faces as well as own-race faces; however, Caucasian subjects showed stronger behavioral other-race effects. In the study phase, memory encoding was assessed with the ERP difference due to memory (Dm). Other-race effects in memory encoding were only found for Caucasian subjects. For subsequently "recollected" items, Caucasian subjects showed less positive mean amplitudes for own-race than other-race faces indicating that less neural activation was required for successful memory encoding of own-race faces. For the comparison of subsequently "recollected" and "familiar" items, Caucasian subjects showed similar brain activation only for own-race faces suggesting that subsequent familiarity and recollection of own-race faces arose from similar memory encoding processes. Experience with a race also influenced old/new effects, which are ERP correlates of recollection measured during recognition testing. Own-race faces elicited a typical parietal old/new effect, whereas old/new effects for other-race faces were prolonged and dominated by activity in frontal brain regions, suggesting a stronger involvement of post-retrieval monitoring processes. These results indicate that the other-race effect is a memory encoding- and recognition-based phenomenon.

Young, S. G.; Hugenberg, K.; Bernstein, M. J.; Sacco, D. F. (30 August 2011). "**Perception and Motivation in Face Recognition: A Critical Review of Theories of the Cross-Race Effect**". *Personality and Social Psychology Review* **16** (2): 116–142.
Abstract

Although humans possess well-developed **face** processing expertise, **face** processing is nevertheless subject to a variety of biases. Perhaps the best known of these biases is the **Cross-Race Effect—the** tendency to have more accurate **recognition** for same-**race** than **cross-race faces.** The current work **reviews** the evidence for and provides a **critical review** of **theories** of the **Cross-Race Effect**, including perceptual expertise and social cognitive accounts of the bias. The authors conclude that recent hybrid models of the **Cross-Race Effect**, which combine elements of both perceptual expertise and social cognitive frameworks, provide an opportunity for theoretical synthesis and advancement not afforded by independent expertise or social cognitive models. Finally, the authors suggest future research directions intended to further develop a comprehensive and integrative understanding of biases in **face recognition.**

TOPIC: Weapon Focus

The following text borrows extensively from Wikipedia, which offers a helpful synopsis of ***weapon focus***.

Weapon focus is a factor affecting the reliability of eyewitness testimony. Weapon focus signifies a witness to a crime diverting his or her attention to the weapon the perpetrator is holding, thus leaving less attention for other details in the scene and leading to memory impairments later for those other details.[1] Elizabeth Loftus, Yuille and Burns, have all been associated with studies showing the existence of a weapon focus effect. According to a 2001 survey of eyewitness experts, 87% found the effect sufficiently reliable to form the basis of expert testimony in criminal trials.[2]

Background Information

In the field of forensic psychology, researchers have validated the weapon focus effect and shown that a witness will remember less about a crime, or the perpetrator of a crime, when a weapon is present, as opposed to if the weapon is not present at an identical crime. As for the reason the phenomenon occurs, the two leading explanations attribute it to the cognitive arousal of the victim, or to the overall unusualness of the situation.[3]

In one of the earliest known investigations of weapon focus, Johnson and Scott (1976) had two groups of participants come into what they thought was a laboratory study of human memory. In actuality they were to take part in a simulated interaction intended to determine whether the presence of a weapon would influence eyewitness memory for an event. Participants in the control condition sat in a waiting room where they overheard a conversation between two people following which a man exited with greasy hands and a grease pen. In the weapon condition participants sat in the same waiting room, but instead they heard a violent argument - including furniture being thrown around - following which a man came out holding a blood-stained knife. During a photo line-up, the control participants were more likely to accurately identify the man they saw in the waiting room relative to participants in the weapon condition (49% versus 33% correct identifications).[4]

The study conducted by Johnson and Scott (1976) represents one of the few simulation studies available, likely due to the ethical issues surrounding the exposure of research participants to a putatively threatening scenario. For this reason much of the research conducted on the weapon focus effect has made use of videos or slide shows.[4] In one of the first such experiments, Loftus, Loftus and Messo (1987) had participants watch a video in which a young man approached the counter of a fast food restaurant, presented an object to the cashier, accepted money and left. In the control condition the man presented a cheque to the cashier whereas in the weapon condition the man presented a gun. Specialized equipment tracked the participant's gaze as they viewed the video to determine with what frequency (and for how long) they fixated upon the item of interest (the cheque or the gun). Relative to the control condition, participants in the weapon condition looked at the item the man was holding more frequently and for greater duration. Further, when tested for the details of the event, performance was better for the control condition relative to the weapon condition - with the exception that participants in the weapon condition were more likely to recall what object the man was holding (a gun).[5]

Since the initial research conducted by Johnson and Scott (1976) and Loftus et al. (1987) others have demonstrated a similar effect using not weapons but unusual objects. For example, Pickel (1998) demonstrated an effect comparable to weapon focus using a video in which a man approached a cashier and presented a whole raw chicken or miniature Pillsbury Dough Boy instead of an expected item such as a wallet. From her finding, Pickel (1998) argued that the

weapon focus arose from the unusual nature of the object in the relation to the context in which it was presented. The relative contributions of arousal and unusualness remains one of the primary theoretical issues in this literature, with some authors arguing for a contribution of both.[6]
Another significant challenge to the weapon focus effect has been its ecological validity. Specifically, many theorists have argued that the effect is limited to the laboratory. These claims have been supported by the relative absence of applied evidence supporting the effect. Several reports have been published looking for evidence of a weapon focus effect using records of actual criminal events. According to the laboratory findings summarized above, the prediction had been that eyewitness memory would be worse for weapon crimes compared to non-weapon crimes. Many of the primary studies failed to support this prediction.[7] Even so, a recent meta-analysis conducted by Fawcett et al. (2013) has demonstrated that when the data for all of the applied studies are combined, there is a small but reliable effect suggesting that weapon presence impairs actual eyewitness memory. This finding supports the laboratory studies conducted on this topic.[8]

Why Weapon Focus Occurs

Why weapon focus occurs has been described a couple different ways. The first is the "automatic capture" explanation. This suggests that the attention paid to a weapon is automatic and unintentional. Studies have been performed that show that even if a subject is asked to ignore specific stimuli they are unable to thus eliciting an automatic response.[9] However, other research shows that attention focus is not automatic and can be directed on command, especially if attention is already focused somewhere specific. If attention is already focused away from a certain stimulus, then automatic capture is avoidable.[10]

Pickel, Ross, and Truelove (2006) decided to take a more in depth look at these ideas and apply them specifically to weapon focus. If weapon focus is an automatic process, then the capture of attention may be out of an eyewitness' control. However, if there is no automatic capture of the witness' attention, then weapon focus effect may be able to be overcome. Specific training can be developed to teach a person who may be at risk of an armed robbery, such as a bank teller or cashier, to perform an identification that is comparable to if there was no weapon present. The data indicate that weapons do not capture attention automatically and involuntarily. If a witness was given a lecture about weapon focus and the problems that can arise in memory formation in an incident when a weapon is present at the scene, they can more accurately identify a perpetrator of a crime. This shows that with proper training weapon focus effect can be overcome and an eyewitness' testimony becomes more accurate. These findings, however, are theoretical and need to be replicated in real world situations to really assess the usefulness of them. They show great promise that weapon focus effect and be counteracted by education on the topic, but they will remain theoretical until further research and implementation of the idea can be conducted.[11]

Reducing Weapon Focus

One method that has become more and more prevalent to reduce negative consequences that can stem from errors in eyewitness testimony, including errors that can arise from weapon focus effect, is expert witness testimonies by research psychologists about eyewitness testimony.[12] This is an educational session, which a judge has to allow, given by a forensic psychologist to a jury as part of the trial. This form of expert testimony has been called social framework testimony, defined by Cronin [13] as "expert testimony that presents conclusions based on social science research to assist the court in making a decision." The expert testimony would provide the jury with a context for evaluating eyewitness testimonies and the jury is meant to factor that into its decision making process.[12] These educational sessions in the courtroom will help make the presentation of eyewitness testimony as rigorous as process and put as much scrutiny on the

social evidence as what is put on physical, scientific evidence. Eyewitness testimony is very often wrong, and the scrutiny put on it greatly reduces the number of false convictions.[13]
The major problem with this strategy is that many judges do not allow this expert testimony in their courts. Their reasoning is usually that they think what the social framework testimony will present is common knowledge. However, the data overwhelmingly shows that the typical jury member does not know most of the information presented by the expert. The fallibility of eyewitness testimony is not common knowledge and eyewitness psychology can offer valid and constructive information to juries. Even with this knowledge, jury decisions cannot perfectly serve justice without exceptions but perfection in the legal system is an unattainable goal. However, any information the can be presented about the shortcomings of eyewitness testimony can better serve justice in the long run.[12]

There can be some ethical concerns to these expert witnesses. There are arguments that suggest that these social framework testimonies serve to discredit the eyewitnesses and put the victims and bystanders on trial. This is not the purpose of the experts though. These testimonies are merely attempting to educate jury members of problems that can arise from eyewitnesses. There can also be issues raised about the credibility of the expert testimonies. The screening process of the experts is not very stringent and the criteria of an expert witness are not laid out in black in white. This can lead to a battle of the experts between prosecution and defense. Any testimony the prosecution of defense deems relevant to contradict the opposing side, and if the judge allows it, an expert can be called and a battle of the experts can ensue. This takes away from the central point of a trial and can overwhelm the jury. This can also perpetuate the stereotype of a ruthless lawyer type.[12]

1. Steblay, Nancy Mehrkens (1992). "A meta-analytic review of the weapon focus effect.". *Law and Human Behavior*. 16(4): 413–424.
2. Memon, Amina (May 2001). "On the "general acceptance' of eyewitness testimony research: A new survey of the experts". *American Psychologist*. 56(5): 405–416.
3. Eugenio, Paul (1990). "Weapon focus, arousal, and eyewitness memory: Attention must be paid". *Law and Human Behavior* **14**: 167–184.
4. Scott, B. (1976). "Eyewitness testimony and suspect identification as a function of arousal, sex or witness and scheduling of interrogation". *Paper presented at the American Psychological Association Annual Meeting*.
5. Messos, Jane (1987). "Some facts about weapon focus". *Law and Human Behavior*. 11(1): 55–62.
6. Pickel, Kerri (1998). "Unusualness and threat as possible causes of "weapon focus"". *Memory* **6(3)**: 277–295.
7. Mather, Mara (1998). "The weapon focus effect revisited: The role of novelty". *Legal and Criminological Psychology* **3**: 287–303.
8. Christie, John (2013). "Of guns and geese: A meta-analytic review of the 'weapon focus' literature". *Psychology, Crime & Law*. 19(1): 35–66.
9. Yantis, Steven (1992). "Involuntary attentional capture by abrupt onsets". *Perception & Psychophysocs*. 51(3): 279–290.
10. Jonides, John (1996). "Attentional Capture by Abrupt Onsets: New Perceptual Objects or Visual Masking?". *Journal of Experimental Psychology: Human Perception and Performance*. 22(6): 1505–1513.
11. Truelove, Ronald S. (2006). "Do weapons automatically capture attention?". *Applied Cognitive Psychology* **20**: 871–893.
12. Leippe, M. R. (1995). "The case for expert testimony about eyewitness memory.". *Psychology, Public Policy, and Law* **1(4)**: 909–959.
13. Cronin, Christopher (2009). *Forensic Psychology: An applied approach*. Kendall Hunt Publishing Company.

Books (and chapters)

Pickel, K.L., (2007), **Remembering and Identifying Menacing Perpetrators: Exposure to Violence and the Weapon Focus Effect**. In *Handbook of Eyewitness Psychology, Vol. 2.* Lindsay, R.C., Ross, D.F., Read, J.D., Toglia, M.P. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, pp.339-360.

Engelberg, E., Christianson, S. (2002). **Stress, Trauma, and Memory.** In *Memory and Suggestibility in the Forensic Interview*. Eisen, M.L., Quas, J.A., Goodman, G.S. (Ed.), Lawrence Erlbaum Assoc., Mahwah, New Jersey, p.146.

Research Articles

Loftus, E., Loftus, G., Messos, J. (1987). **Some facts about weapon focus.** *Law and Human Behavior*. 11(1): 55–62.

Abstract

Weapon focus (WF) refers to the decreased ability to give an accurate description of the perpetrator of a crime by an eyewitness because of attention to a weapon present during that crime. In Exp 1, 64 undergraduates viewed a mock crime scene in which a weapon was either highly visible or mostly hidden from view. Ss in the highly visible weapon group recalled significantly less feature information. The 2nd series of experiments tested the WF effect in a nonemotional situation in which the "time in view" of both the weapon and the individual's face were manipulated. A series of 6 slides were used in which either the weapon or the face was not in view for specific intervals within the sequence. The WF effect was found to occur within a nonarousing, environmentally stark setting and was dependent on the percentage of time the weapon was visible.

Kramer, T.H., Buckhout, R., Eugenio, P. (Apr. 1990). **Weapon focus, arousal, and eyewitness memory: Attention must be paid.** *Law and Human Behavior*, Vol 14(2), Apr 1990, 167-184.

Abstract

Weapon focus (WF) refers to the decreased ability to give an accurate description of the perpetrator of a crime by an eyewitness because of attention to a weapon present during that crime. In Exp 1, 64 undergraduates viewed a mock crime scene in which a weapon was either highly visible or mostly hidden from view. Ss in the highly visible weapon group recalled significantly less feature information. The 2nd series of experiments tested the WF effect in a nonemotional situation in which the "time in view" of both the weapon and the individual's face were manipulated. A series of 6 slides were used in which either the weapon or the face was not in view for specific intervals within the sequence. The WF effect was found to occur within a nonarousing, environmentally stark setting and was dependent on the percentage of time the weapon was visible.

Steblay, Nancy Mehrkens (1992). **"A meta-analytic review of the weapon focus effect.".** *Law and Human Behavior*. 16(4): 413–424.

Abstract

This meta-analytic review examined 19 tests of the weapon focus effect, the hypothesis that the presence of a weapon during commission of a crime will negatively affect an eyewitness's ability to later identify the perpetrator. A significant overall difference between weapon-present and weapon-absent conditions was demonstrated, with weapon presence leading to reduced identification accuracy. Overall, the size of the effect was small for the dependent measure of lineup identification accuracy and moderate for feature accuracy. Discussion focuses on those factors that appear to mediate and facilitate the weapon focus effect.

Jonides, John (1996). **"Attentional Capture by Abrupt Onsets: New Perceptual Objects or Visual Masking?"** *Journal of Experimental Psychology: Human Perception and Performance*. 22(6): 1505–1513.

Abstract

The authors have shown that an object appearing abruptly in a previously blank location is efficiently detected in visual search when it is embedded in an array of objects without abrupt onset (termed no-onset stimuli). In these experiments, no-onset stimuli appeared well before the onset stimulus but were camouflaged by additional line segments rendering the stimuli unidentifiable. B. S. Gibson (1996) claims that the availability of the no-onset stimuli was delayed relative to that of the abrupt onset stimulus because of forward masking. The authors show that forward masking is unlikely to be a significant factor in their experiments, and 3 new experiments are reported that undermine Gibson's masking account. Observed differ- ences in the efficiency with which onset and no-onset stimuli are processed in visual

search are due to attentional capture by new perceptual objects and to a relatively sluggish process of updating existing object representations.

Pickel, Kerri (1998). "**Unusualness and threat as possible causes of "weapon focus**". *Memory* 6(3): 277–295.

Abstract
Examined both threat and unusualness as possible explanations for "weapon focus" in eyewitness memory. In 2 experiments, a total of 486 Ss viewed videotapes depicting interactions in business establishments. The target character was either empty-handed or held different objects that varied in both threat and unusualness. Witnesses attempted to describe the target's features and clothing, identify the object held by him (if any), and identify him in a photo line-up. The accuracy of witnesses' descriptions was affected by unusualness but not threat. Identification accuracy did not differ by condition. Witnesses had difficulty remembering the low-threat, non-unusual object; many either failed to identify it (Exp 1) or reported seeing no object (Exp 2). Results of both experiments imply that weapon focus, when it occurs, may do so because weapons are unexpected.

Truelove, Ronald S. (2006). **"Do weapons automatically capture attention?".** *Applied Cognitive Psychology* **20**: 871–893.

Abstract
Two experiments explored whether weapons automatically capture attention or whether eyewitnesses can overcome the weapon focus effect if so instructed. Witnesses heard a lecture that either instructed them to attend to the target individual and avoid fixating on the weapon or presented unrelated information. Subsequently, they observed the target carrying either a weapon or a book and attempted to remember his appearance. Control witnesses reported fewer correct and more incorrect details when he carried a weapon rather than the book. However, the reports of educated witnesses did not differ between object conditions. Additionally, witnesses' ability to avoid weapon focus was unaffected by weapon unusualness and elevated arousal levels, and control witnesses provided better descriptions of the weapon than the book.

Christie, John (2013). **"Of guns and geese: A meta-analytic review of the 'weapon focus' literature".** *Psychology, Crime & Law*. 19(1): 35–66.

Abstract
Weapon focus is frequently cited as a factor in eyewitness testimony, and is broadly defined as a weapon-related decrease in performance on subsequent tests of memory for those elements of an event or visual scene concurrent to the weapon. This effect has been attributed to either (a) physiological or emotional arousal that narrows the attentional beam (arousal/threat hypothesis), or (b) the cognitive demands inherent in processing an unusual object (e.g. weapon) that is incongruent with the schema representing the visual scene (unusual item hypothesis). Meta-analytical techniques were applied to test these theories as well as to evaluate the prospect of weapon focus in real-world criminal investigations. Our findings indicated an effect of weapon presence overall ($g = 0.53$) that was significantly influenced by retention interval, exposure duration, and threat but unaffected by whether the event occurred in a laboratory, simulation, or real-world environment.

About Dr. Paul Simpson

- Certified as an Expert Mental Health Evaluator by the Arizona Supreme Court.
- Since 2003 has provided over 240 one-day trainings in all 50 states for counseling professionals and probation officers on assessing and treating sexual compulsions.
- Has an extensive background in working with victims and perpetrators of sex crimes in outpatient and inpatient settings. This has included individual and family counseling, group counseling, and court-ordered psychosexual evaluations.
- As a former case manager with Child Protective Services (Tucson), Dr. Simpson has an extensive background in working with victims and perpetrators of sex crimes in outpatient and inpatient settings. This has included individual and family counseling, group counseling, and court-ordered psychosexual evaluations.
- Taught a graduate course in Adolescent Psychology for Northern Arizona University.
- Former case manager with Child Protective Services (Tucson).
- Author of *Second Thoughts*, a book that was instrumental in helping expose the false claims and dangers of 'recovered memory therapy.' Throughout the 1990's Dr. Simpson was a leading national educator on *False Memory Syndrome* and trained thousands of counseling professionals on standards of practice. He also served as an expert consultant to the *Arizona Board of Psychologist Examiners.*
- Dr. Simpson has been a guest on *The Joan Rivers Show*, the *Leeza Gibbons Show*, *Parent Talk Radio*, *Focus on the Family*, *Frontline*, and *Fox News*. He has been a professional consultant to a number of national media, including *20/20*, *60 minutes*, *NBC News*, *Nightline*, *The Oprah Winfrey Show*, the *Chicago Tribune*, *Dateline*, *The Today Show*, *Focus on the Family*, and *Vanity Fair magazine*.

Publications and Research

Simpson, P. (1997). *Second Thoughts: Understanding The False Memory Crisis*. Nashville: Thomas Nelson Publishers.

Nelson, E., & Simpson, P. (1994, Summer). First Glimpse: An Initial Examination of Subjects Who Have Rejected Their Recovered Visualizations as False Memories. Issues In Child Abuse Accusations, 6 (3), 115-123.

Training

Violence Risk Assessment: Structured Professional Judgment and the HCR-20 Version 3. American Academy of Forensic Psychology. (February 7, 2015). Las Vegas, NV.

Improving Testimony in Deposition and Trials. American Academy of Forensic Psychology. (February 6, 2015). Las Vegas, NV.

Developmental Pathways to Conduct Disorder and the DSM-5 Specifier "with Limited Prosocial Emotions": Implications for Understanding, Assessing, and Treating Severely Aggressive and Antisocial Youth. American Academy of Forensic Psychology. (February 5, 2015). Las Vegas, NV.

Challenges and Pitfalls in Using the DSM-V in Forensic Evaluations. American Academy of Forensic Psychology. (Sept. 4, 2014). San Antonio, TX.

Forensic Evaluation in Disputed Confession Cases. American Academy of Forensic Psychology. (Sept. 3, 2014). San Antonio, TX.

Assessing Sexually Abusive Children and Adolescents: MEGA (Multiplex Empirically Guided Inventory of Ecological Aggregates. (August 21-22, 2014), San Diego, CA.

Personality Disorders: The Challenges of the Hidden Agenda. (April 10, 2014), Tucson, AZ.

Risk Assessment, Community Management, and Treatment for Juvenile and Adult Sex Offenders. (May 2-3, 2013), Phoenix, AZ. Presented by AzATSA.

Practical Psychopharmacology: What Every Mental Health Professional Needs to Know About Psychotropic Medications. (Nov. 26, 2012), Tucson, AZ.

Memory. Institute for Brain Potential. (Nov. 7, 2012), Phoenix, AZ.

FBI Citizens Academy. Eight-week training. (March 28, 2012). Tucson, AZ.

Training Mental Health Experts in Legal Competency and Restoration. Arizona Supreme Court. (Feb. 22-24, 2012). Phoenix, AZ.(Certification to provide forensic services in AZ courts)

Ethical and Effective Court Testimony. American Academy of Forensic Psychology. (Nov. 5, 2011). Dallas, TX.

Mental Health Evaluations in Homicides and Crimes of Violence. State Bar of Arizona CLE, June 2, 2011. In addition to receiving training, I presented on psychological evaluations (State-of-Mind, competency, future risk) and participated with a panel of judges, prosecutors, and defense attorneys.

Advanced Forensic Psychology Practice: Issues & Applications. American Academy of Forensic Psychology. (2011, March 31 – April 2, Albuquerque, NM).

Children's Memory: Interviewing Children to Preserve Accurate Testimony. American Academy of Forensic Psychology. (Sept. 19, 2008).

Clinical Neuropsychology for the Forensic Psychologist. American Academy of Forensic Psychology. (2008, January 11). San Antonio, TX.

Critical Issues In Child Sexual Abuse Allegations. American Academy of Forensic Psychology. (2006, Feb. 24). Houston, TX.

Survey Intensive Workshop in Forensic Psychology. American Academy of Forensic Psychology. (2002, April 18-21). Atlanta, GA.

Expert Witness Training. *Arizona Psychological Association*. (1996, June 18). Phoenix, AZ.

Don't tell anyone, but all of the above boring stuff is really a clever disguise to hide Dr. Simpson's true identity – a mandolin-picking, bluegrass jamin' nutcase. As a board member of the *Desert Bluegrass Association* (www.desertbluegrass.org) he wastes all kinds of time and money on a tremendously un-cool obsession – much to the embarrassment of his two children. If you want to embarrass your children as well, come and sit in on a free Bluegrass Workshop he leads every Monday night on the eastside of Tucson.

You can contact him at:

Paul Simpson, Ed.D.
7510 N. La Cholla Blvd.
Tucson, AZ 85741
(520) 355-1000
crimeshrink@gmail.com
www.drpaulsimpson.com