Factors influencing the way in which we construct and reconstruct memories

by Patricia Karsten

Human memory can be seen as a complex system whose functioning is influenced by many interdependent factors. When examining the construction and reconstruction of memories, the memory system is understood as an active process influenced by individual, subjective factors, an interpretation which goes beyond the apparently objective, biological mechanism of encoding, storage and recall of the events that an individual experiences. While 'construction' refers to the process of interpreting incoming information in light of previous experience and knowledge, 'reconstruction' occurs when original memory is altered by merging it with new, additional information (Brace and Roth 2007). After briefly presenting the building blocks of the memory system and basic memory processes, a discussion grounded in the information processing approach of the cognitive psychology perspective evaluates how factors like prior knowledge, post-event information, as well as physiological factors or individual strategies, affect the way individual memories are constructed and reconstructed.

According to the information processing approach, memory comprises three distinct subsystems, which are connected through flows of information: Sensory memory, where incoming sensations are briefly held and encoded for further internal processing, short-term or working memory where incoming information is combined with previously stored knowledge, and long-term memory which acts as an unlimited-capacity storage facility (Brace and Roth, ibid.). Consequently, the memory system is conceived to use three basic processes: encoding of information, transient or permanent storage, and retrieval of information. The factors influencing construction and reconstructing of memories may act upon all three basic processes.

The very nature of memory as a constructive process beyond accurate recording for later retrieval was illustrated by research conducted by Sir F. Bartlett, who used meaningful stimuli such as adventure stories to analyse the effects of prior knowledge and context upon memory (Bartlett 1932, as cited in Brace and Roth, 2007). When presented with a story from a different cultural background, which they later had to retell, research participants' memory of the story differed considerably from the original version, in that they omitted details, but also in that they interpreted 'unclear' or ambiguous events in terms of their own cultural understandings. Bartlett theorized that individual experiences lead to the construction of mental schemata which serve as a framework for the interpretation of new information. His research shows that memory can be seen as a constructive process of 'making sense' of the environment, which is influenced by previous experiences and cultural context. This view is effectively illustrating and supporting the information processing approach to working memory as the locus of combination for new information and existing knowledge retrieved from long-term memory.

Furthermore, memory is not only constructive, but also reconstructive, in that post-event information as well as inner responses to an event, like thoughts or images, or even other persons' memories, may be incorporated into original memory and change or distort it. Post-event information may exercise a 'misinformation effect', as was shown by Loftus and Palmer (1974, as cited in Brace and Roth 2007), when they presented research participants with a video of a car accident and later asked them to estimate the car's speed. Participants' speed estimates increased with the violence implied in the words used when asking about the accident, suggesting that memory of the event had been altered by the information contained in the questions.

Citation: Karsten, Patricia (2009) Factors influencing the way in which we construct and reconstruct memories, from http://www.patriciakarsten.com

Crombag et al. (1996, as cited in Brace and Roth 2007) tested participants' memories in a study about the Amsterdam airplane crash, and found that, although there existed no video material on the exact moment of the airplane crashing, participants claimed to remember having seen it and even gave accounts on the position of the airplane and other details. These findings show that original memory can include own thoughts and imagery in response to second-hand information about an event, for example media coverage, and that different sources of memories can not necessarily be identified later on.

Even other persons' memories may be incorporated indistinguishably from original memory, as was illustrated by the accounts of Chilean playwright Ariel Dorfmann and psychologist Jean Piaget, who both had memories about early childhood events which they later understood to have been implanted by other person's tellings (Brace and Roth, ibid.). Dorfmann's memories concerned a deliberate decision at the age of 3 to not speak Spanish anymore, which he must have constructed from listening to his family members re-telling the event. Jean Piaget remembered vividly to have been kidnapped at very young age, an event which the nurse later admitted to have invented. While these personal accounts may not be simply generalized, they nevertheless illustrate how memories can be implanted, leading to beliefs about events because of a confusion about the source of information.

A tentative explanation along Bartlett's lines of prior knowledge and experiences as guidelines for constructing memories is that these memories date back to a very young age, where the individuals lacked elaborate cognitive schemata to make 'adequate' sense of the incoming information and therefore confused other people's accounts and their reactions to it with original experiences. On the other hand, the Amsterdam studies show that the phenomenon of 'misinterpreting the source' is not restricted to children but happens to adults as well, who might be assumed to dispose of adequate interpretative schemas. Brace and Roth (ibid.) point to the rather dramatic nature of the airplane crash. Further research may assess whether the phenomenon is related to the emotional impact of the information on the individual.

Evidence from neurological studies points to biology as a further important factor affecting construction and reconstruction of memories and illustrates the interplay of different memory subsystems. Patient 'HM' showed impairments to long-term memory after brain surgery which removed parts of the temporal lobe including the hippocampus (Scoville and Milner 1957, as cited in Brace and Roth 2007). The impairments were such that HM was able to use his short-term memory, for example to communicate or watch television, but he was unable to form any new long-term memories and so would watch the same TV programs repeatedly without remembering them. In a follow-up study almost 40 years later, HM did not recognize himself in a mirror, because he still believed to be the young man of 25 he was at the time of the operation (Carter 1998 as cited in Brace and Roth 2007). The evidence again corresponds to the information processing approach to the memory system, showing that new material must be combined with previously stored knowledge in order to update long-term memory. In patient HM, something that in normal memory happens effortlessly and unconsciously had been seriously disturbed: He was not able to integrate new information with prior knowledge, and so his stored knowledge about himself had not been updated for a very long time. This illustrate the dependence of 'normal' memory functions on biological factors, highlighting their importance for the construction of autobiographical memory and thus for the individual's sense of identity.

Biological factors may also play a role when it comes to exceptional memory abilities, where individual endowment can be combined with conscious strategies to guide the way of forming or retrieving memories. Memory-enhancing strategies include techniques to increase the processing depth of new material, for example using imagery or making (mental) summaries when new information arrives, or techniques to increase the number of retrieval cues when recalling events, for example by trying to remember as many details as possible or by restating the context in order to provide multiple retrieval

routes (Brace and Roth 2007). While research evidence suggests that these techniques work well with 'normal' memory, they may also lead to maladaptations in some cases.

This is illustrated by a study conducted by Alexander Luria over a period of 30 years involving 'S', a man with exceptional memory abilities (Luria 1969, as cited in Brace and Roth 2007). For example, S was able to accurately memorize Italian poems without understanding a word of Italian, by using his ability to associate the words with visual imagery, when the poem was read aloud to him. On the other hand, S memorized a logical sequence of 4 successive numbers whose starting number increased by one in each row, with the same, processing-intensive visual imagery technique, without realizing their underlying simple structure, which would have provided him with a much more effective retrieval mechanism. The case of S points to the importance of the ability to extract meaning of new information when constructing and reconstructing memories, which seems to be a sign of efficient, 'normal' memory function, even if this leads to less accurate memory on other occasions.

The discussion has considered how prior knowledge and experiences, post-event information, third-party accounts, and conscious strategies may influence the way in which we construct and reconstruct memories, and the overall dependence of 'normal' memory on biological factors. It has become clear that memory is far more than a simple and accurate recording of events for later recall, in that it involves active, interpretative processes which transform environmental stimuli into something meaningful for the individual.

References

Brace, N. and Roth, I. (2007): Memory: structures, processes and skills. In D. Miell, A. Phoenix, & K. Thomas (Eds.), *Mapping Psychology* (2nd ed., Book 1 chapters 6-9, pp. 111-164). Milton Keynes: The Open University