Memory: Symbols, functions or both?

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In recent years, the study of memory has been the subject of discussions among those researchers who try to identify the mechanisms and contents of memory and those who concentrate in discovering their functions. These two approaches differ not only in the theoretical explanations that they offer to some phenomena, but also in which phenomena they consider worth pursuing and how and where these phenomena should be studied (Bruce, 1991; Koriat & Goldsmith, 1996).

From the late sixties on, the predominant line of research focused on the mechanism of memory. This approach was greatly influenced by the computer methaphor (Atkinson & Shiffrin, 1968) and by the emergence of the symbolic paradigms in psychology and cognitive science (Newell & Simon, 1972). Although, the theories within this approach differ, they share a basic principle: Human cognitive functioning is the result of a general purpose symbolic system, that is, of a system that manipulates symbols. (Newell, 1981; Newell & Simon, 1972). This principle implies there are cognitive structures where the symbols are stored and that there are processes to manipulate the symbolic structures. When applied to memory, this basic principle translates into the search for independent memory structures, into the study of the contents of memory (memorial representations and memory traces), and into the investigation of the basic mechanisms by which encoding and retrieval of stored symbols occur. The basic methodological approach involves quantifying the level of recall or the time to activate or recover a memory trace (Koriat & Goldsmith 1996).

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From a functional perspective, the symbolic approach has been criticized regarding several of its assumptions. 1) The search for independent memory systems introduces an artificial separation between memory and other aspects of cognition such as perception, reason and action. "This compartmentalization of function is a throwback to the faculty psychology of Gal, and more generally the structuralist enterprise of analysing the mind into separable components" (Toth &. Hunt, 1999 p.244). Memory is treated as an independent act separate from other cognitive functions, when, however, memory functioning permeates most forms of cognitive processing (e.g. language understanding, question answering, making inferences, reasoning and perceiving). 2) Memory is not "something" (e.g. traces) stored is our mind or brain. Memory is an activity. It is the potential to achieve several actions when certain conditions are met. For example, memory is observed when we recall a previously experienced event in an appropriate retrieval environment, but this does not mean that the event was stored. In Craik's words "the memory trace is perhaps not a specific structure located at some point…, but it is rather an altered potential of the system to carry out certain mental activities provided that the context, task and goals present at the time of learning are also reinstated…Remembering is essentially a form of perceiving" (Craik, 1985, p 200). 3) Memory is not composed of concrete entities. Memory is an interaction between a person and a retrieval environment, and it is, therefore, context specific and dependent onof the tasks and goals. This lack of generalization drives the study of memory phenomena to real life situations and problems (eyewitness testimony, prospective memory, the role of memory in reading, autobiographical memory, memory for actions and so on) (Neisser, 1991; 1996). 4) If memory is a perception of the past, memory should be evaluated by the degree of correspondence to the past and, hence, the types of errors and distortions made by the people are the important data to be observed. This contrasts with the quantity oriented approach taken from the symbolic/structural approach. Since, there are stored elements in the memory systems, memory can be evaluated in terms of the number of elements remaining in the store (percentage of recall) or the speed (response times) by which they are recovered (Koriat & Goldsmith, 1996).

Hence, from one perspective, the purpose of memory research is to identify the basic mechanisms underlying memory phenomena; from the other, the aim is to study the role that memory plays in everyday functioning. The two approaches have developed in separate ways, and some defend the idea that both should coexist and not trying to reach agreement or integration, since they focus on different aspects of memory

and use different methodologies and data to reach their purposes (Koriat & Goldsmith, 1996). However, many lines of research have arisen under the influence of the two metatheoretical approaches, and they show features of theoretical integration. The four papers that appearing in this issue are examples of research lines that integrate features of both theoretical perspectives.

The paper of Engelkamp and Zimmer focuses in the "enactement effect" in the subject performed task paradigm. In this paradigm, subjects perform actions according to the verbal instruction given by the experimenter (e.g. lift the pen, roll the ball). Verbal recall of these performed actions is better than the recall obtained in conditions where the subjects are verbally presented with the actions, but do not have to perform them. The paper by Brandimonte centers on prospective memory, that is, on the recall of planned actions. Hence, both papers share an interest in the functional perspective of the interaction between memory and action, and they both try to understand the way in which memory supports the recall of present and future actions. However, they both take a "mechanistic" approach to the study of this "functional" topic: memories are considered to be stored, and so memory can be evaluated by measuring the number of words recalled or the time needed to recall them.

Similarly, the paper by Massironi, Rochi and Cornoldi represents a functional interests for the possible parallels between imaginative (memory) and perceptual activities. The contrast between visual traces and generated images allows them to explore similarities and differences between perceptual operations (visual trace) and their memorial counterparts (images). But again their approach implies that the results of perceptual and imaginative operations are stored in memory and subjects' reproductions reflect the contents and processes of these memory traces.

Finally, the paper by Saariluoma focused in the contents of memory that support performance in chess related tasks. Therefore, it embraces the functional interest in the role of memory in other mental activities such as thinking. However, as in the other three papers, Saariluoma assumes that basic chess moves and patterns are represented in memory and are the base of "apperception". Apperception refers to the assimilation of perceptual stimuli and conceptual memory information into a consistent representation. Apperception allows expert chess players to "see" chess positions differently from novices and to show superior recognition.

Hence, the four papers offer a mixture of a functional interest and a mechanistic approach to the study of memory. The four of them center on the interaction between memory representations and other cognitive activities such as acting, perceiving and thinking. However, all of them

explore the possible mechanisms by which this interaction is achieved. This mixed approach would probably contribute to reaching integration and continuity between the traditional research within the symbolic paradigm and the more recent theoretical trends toward functional approaches.

REFERENCES

Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. En K. W. Spencer (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 2, pp. 89-195). New York: Academic Press.

Bruce, D. (1991). Mechanistic and functional explanations of memory. *American Psychologist, 46*, 46-49.

Craik, F. I. M. (1985). Paradigms in human memory research. In L. G. Nilsson & T. Archer (Eds.), *Perspectives on learning and memory* (pp. 197-221). Hillsdale, NJ.: Lawrence Erlbaum Associates.

Koriat, A., &y Goldsmith, M. (1996a). Memory metaphors and the real-life/laboratory controversy: Correspondence versus storehouse conceptions of memory. *Behavioral and Brain Sciences, 19*, 167-228.

Neisser, U. (1991). A case of misplaced nostalgia. *American Psychologist, 46*, 34-36.

Neisser, U. (1996). Remembering as doing. *Behavioral and Brain Sciences, 19*, 203-204.

Newell, A. (1981). Physical symbol systems. In D. A. Norman (Ed.), *Perspectives on Cognitive Science*. Hillsdale, NJ.: Lawrence Erlbaum Associates. (Trad. Cast., Barcelona: Paidos Iberica, 1987.).

Newell, A., & Simon, H. A. (Eds.). (1972). *Human problem solving*. Englewood Cliffs, NJ.: Prentice Hall.

Toth, J. P., & Hunt, R. R. (1999). Not one versus many, but zero versus any: Structure and function in the context of the multiple memory systems debate. IEn J. K. Foster &y M. Jelicic (Eds.), *Memory: Systems, Process, or Function?* (1ª ed., pp. 232-272). New York: Oxford University Press.