Memory Advantage of Experts not Based on Chunking

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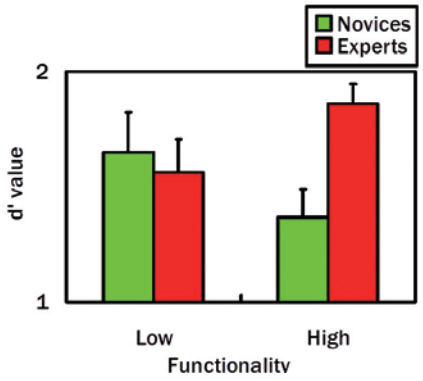
Experts in all subjects have remarkable memory in terms of speed and accuracy. Most previous studies on the memory advantage of experts have been conducted using artificial control tasks such as chess games. A large number of these have suggested that chunking is a significant factor in cognitive expertise. Chunking facilitates the recognition of typical patterns of an element as a unit. For example, chess experts can recognize the arrangement of pieces that occur repeatedly in games as one unit. It has been suggested that chunking improves the experts' cognitive processing in their field of expertise. The present study used mountain scenes as memory stimuli and examined whether the memory advantage of experts appears exclusively for artificial objects, or also for natural and ecologically valid objects. Hiking experts (n = 17) and novices (n = 18) participated in an experiment in which the memory for photographs of mountain scenes taken from a hiking trail was investigated. First, 30 photographs were individually displayed on a screen and participants were required to memorize as many of them as possible. Half the photographs (High Functionality Stimuli) featured elements to which hikers must pay careful attention, such as dangerous places, whereas the remaining half (Low Functionality Stimuli) contained elements that hikers pay little attention, such as distant scenes (Fig. 1). Then, 30 new photographs of mountain scenes were added and the total of 60 photographs were individually displayed in random order. Participants were required to judge whether each photographs had been displayed previously. As can be seen in Fig. 2, the results indicated that experts' memory was significantly better for High Functionality Stimuli than for Low Functionality Stimuli, whereas the novices did not show such a difference. The natural scenes used in this study had no typical patterns that may have contributed to chunking, but nevertheless, experts displayed a memory advantage. These findings indicate that cognitive expertise cannot be explained only by chunking, and that attention should be considered.

Fig. 1

Fig. 2 ▶



Spontaneously Occurring Mother-infant Swapping and the Relationships of Infants with Their Biological and Foster Mothers in a Captive Group of Lowland Gorillas (*Gorilla gorilla gorilla*)

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Fig. 1 Six months after mother-infant swapping, the older infant (*Ndjole*) at one and a half year of age still sough refuge with her biological mother more frequently than with her foster mother.

Fig. 2 After *Ndjole* was weaned at three years of age by her foster mother who adopted the younger infant, *Ndjole* was sometimes observed to look at her foster mother nursing the younger infant (left) and to touch her foster mother's nipple with her fingers (right). Soon thereafter, *Ndjole* started to exhibit abnormal hair-plucking behavior.

Fig. 3 When *Ndjole* was five and a half years old, she was separated from the other group members and was introduced to a new gorilla group. Thereafter, she ceased to display the unusual hair-plucking behavior. When she was 10 years old, *Ndjole* gave birth to her first baby and has been a wonderful mother.

A young adult female gorilla living in a social group at the San Diego Wild Animal Park, California, USA, gave birth to her first infant, but she placed her infant on the floor and ignored the crying infant. Following this, a mature adult female with a 10-month-old female infant began to take care of the neonate, including nursing. The young mother did not show any apparent interest her own infant. Instead, she started to hold and carry the older infant on the day after giving birth, and two weeks later the older infant started to nurse from the young female. Three months thereafter, the infant stopped nursing from her own mother, indicating that the completion of infant-swapping that took place between the primiparous young adult mother with neonate and the multiparous mature adult mother with the 10-month-old infant.

Thereafter, the mothers provided appropriate maternal care including nursing to their adopted infants, but the older infant, *Ndjole*, still sought refuge with her biological mother more frequently than with her foster mother when *Ndjole* was faced with a stressful or frightened situation, indicating that *Ndjole* did not completely transfer her attachment from her biological mother to her foster mother. Almost two years later, the younger infant who was weaned by its foster mother began nursing from its biological mother, who subsequently weaned her adopted infant (i.e., the older infant *Ndjole*). Then, *Ndjole* who was weaned exhibited abnormal hair-plucking behavior. *Ndjole*'s abnormal behavior is probably caused by the fact that *Ndjole* had to lose her primary caregiver twice: first, her biological mother and second, her foster mother. These observations suggest that it was psychologically stressful for the gorilla infant to quickly transfer its attachment figure from the mother to another adult female when the former attachment figure continued to remain in the group. The present observations on behavioral and psychological changes in the infant after the mother-infant swapping in a captive social group of gorillas, which are the closest relatives of humans, can contribute greatly to understanding human mother-infant relationships.