Do People with Varying Cognitive Styles Access Semantic Knowledge Differently?

Ariela Gigi (Ariela.Gigi@sheba.health.gov.il)
Department of Behavioral Sciences, College of Judea and Samaria, Ariel 44837, Israel
The Joseph Sagol Neuroscience Center, Sheba Medical Center, Tel-Hashomer 52621, Israel

Keywords: Semantic memory; Categorization; Cognitive style; functional choice

Background

The sensory/functional theory, which was originally proposed by Warrington and Shallice (1984), makes two crucial assumptions about the organization of the semantic system and the structure of semantic categories: The first assumption is that the semantic system is organized into modality-specific components, of which the most important are the visual and the functional/associative components. The second is that activation of either the visual or functional properties of an object will result in the activation of that object's properties in the other network. This means that independently of whether questions are asked about the visual or the functional attributes of an object, all of the semantic attributes of the object will be activated. On the other hand, people are known to differ in their cognitive style (e.g. visual/semantic). The current research explored whether these two groups of different cognitive-styled people (visual/semantic) use different approaches in retrieving information from semantic knowledge.

Methodology

In this pilot study, twenty eight healthy young psychology students (ages 20-35 years) were studied, using a computerized test. They were presented with 20 groups of words. Each group included 4 items, in which one of the four was functional extraordinary and another one was visual extraordinary. Counter balance was done for optional extraordinary locations. Participants were instructed to choose one extraordinary item by pressing one of four marked buttons, as quickly as possible. Answers and reaction times (RT; ms) were recorded. For each participant a semantic index was created (according to his/her visual/functional extraordinary selections) and each participant was noted as having either a 'visual' or 'semantic' style.

Results

Overall, the 'functional' responses were found to be significantly faster (5584.6±1629.9) than the 'visual' (6344.2±1703.7) extraordinary responses (p=0.05). According to the 'semantic index', most of the participants were found to be 'semantic' (20), and only eight participants were found to have 'visual' style. 'Semantic style' participants responded faster (the mean RT for all responses was 5263.7±1019.4) than the 'visual style' participants (6172.7±1574.9; p=0.08, n.s). The two groups (semantic/visual) obtained almost the same RT when choosing visual extraordinary items (6398.1±1828.8 vs. 6209.4±1445.4 ms respectively). However, the 'semantic' participants responded significantly faster to functional extraordinary items (5159.6±1156.0) than the 'visual' participants did (6647.4±2193.8; p=0.03).

Discussion

According to one account, different types of knowledge are stored within different brain regions (Thompson-Schill, 1999). In contrast, the alternative framework posits that all semantic information is coded within a unitary neural system. Warrington et al proposed a currently popular feature-based account of semantic memory organization (Warrington and Shallice, 1984). According to this view, different types of object features (e.g., visual, auditory, motor, olfactory, abstract/verbal) are stored in distinct brain regions. The results of this study show a significant difference between 'semantic' and 'visual' styled participants in RT of 'functional' choices, but no differences were obtained for the 'visual' choices. This may support the model proposed by Warrington and Shallice (1984). Moreover, seems that 'semantic' participants are activated the two semantic storages ('fnctional' and 'visual') but tend to use more easily the functional one, but 'visual' styled participants are not. Using dynamic neuroimaging may help resolve this issue.

References

Thompson-Schill, S. L., Aguirre, G. K.' DwEsposito, M. & Farah, M. J. (1999). Aneural basis for category and modality specificity of semantic knowledge. *Neuropsycologia*, 37, 671-676.

Warrington EK, Shallice T. (1984). Category specific semantic impairments. *Brain* 107, 829-854.