Residual knowledge of objects in semantic dementia: Semantic or ''semantic-like''?

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It has been consistently noted that patients with semantic dementia are still able to complete daily domestic activities in spite of the sometimes severe impairment of single object knowledge demonstrated in formal assessments. Several factors, that are not mutually exclusive, may give rise to this apparent paradox. First, the objects encountered by the patient in her daily activities might be more familiar to her than the ones probed in formal tests of object knowledge, and premorbid object familiarity has been shown to be an important factor in predicting the impact of progressive semantic impairment on the integrity of conceptual representations (Lambon Ralph, Graham, Ellis, & Hodges, 1998). Second, patients may have some residual superordinate or/and broad functional knowledge that may suffice to permit correct use for at least some items, particularly if encountered in their usual location and together with objects serving the same purpose (e.g., encountering a toothbrush with toothpaste on bathroom sink). Third, the patient's current repeated experience with her own objects could help maintaining at least personally relevant knowledge for these objects (Snowden, Griffiths, & Neary, 1994).

These accounts have in common the notion that the appropriate use of personal objects by semantic dementia patients would be based on some residual *semantic* knowledge. In contrast, Graham, Lambon Ralph, and Hodges (1999) suggested that the information these patients could retrieve about frequently encountered objects is only ''semantic-like.'' It is based on the patients having learnt an association between a perceptual representation of an object, a particular motor skill and a specific context. Thus, it differs from ''true'' semantic information by being highly specific, nonabstract, and nongeneralizable across similar items. In this study, we assessed residual object knowledge in a patient with semantic dementia with the aim of determining whether the knowledge she demonstrated with her own objects was generalizable or not to new and alternative exemplars of the same items.

Case history

MJB (born 1918) is a right-handed woman with 16 years of formal education. She presented in 1996 with a 6-year history of word-finding difficulties. Both neuropsychological and neuroanatomical data collected at this time concurred with the diagnosis of semantic dementia. At the time of this study, the patient was profoundly anomic and severely impaired in word (7/16 for very high-frequency words of a word-to-picture matching task) and picture comprehension (10/52 on the Pyramid and Palm Tree Test).

Experimental study

With the help of the patient's spouse, we selected 20 of the patient's own manipulable objects that were still regularly used by her (Familiar, Own) and 20 manipulable common objects, not from the patient's home, that were currently not used by her (Unfamiliar, Control). Then, two alternative instances of each Familiar/Own and Unfamiliar/Control object were obtained from the experimenter's own home, one being perceptually similar (PS), the second as perceptually dissimilar as possible (PD) from the Own or Control exemplar. The patient's residual knowledge for the three exemplars of each of the Familiar objects (Own, PS, and PD) and the three exemplars of each of the Unfamiliar objects (Control, PS, and PD) was assessed with the tasks below. Items were presented randomly in a neutral context and in several sessions. Only one exemplar of a given object was presented during a given session. The results are displayed in Fig. 1.

Object decision task

Black-and-white drawings of the selected objects (except the PS exemplars) were prepared together with an equal number of drawings picturing unreal objects. Unreal object pictures were made up by replacing a component of the real object by a component of a closely related object. MJB performed better for Familiar than Unfamiliar objects ($\chi^2_{(1)} = 7.15$, $p < .01$). No significant effect of exemplar was observed for Familiar ($\chi^2_{(1)} = 1.38$, $p = .23$) or Unfamiliar objects ($\chi^2_{(1)} < 1$).

Unconstrained object classification

The patient was presented with colour photographs of the objects from the three sets of Familiar and Unfamiliar objects successively and asked to classify them in as many stacks she wished, and then to label each of the stacks. Unclassified objects (nonresponses) and objects that did not belong to the category labelled by the patient (errors) were considered incorrect responses. MJB's performance was better for Familiar than for Unfamiliar objects ($\chi^2_{(1)} = 15.40$, $p < .0001$), but there was no significant effect of exemplar for Familiar ($\chi^2_{(2)} < 1$) or Unfamiliar objects ($\chi^2_{(2)} < 1$).

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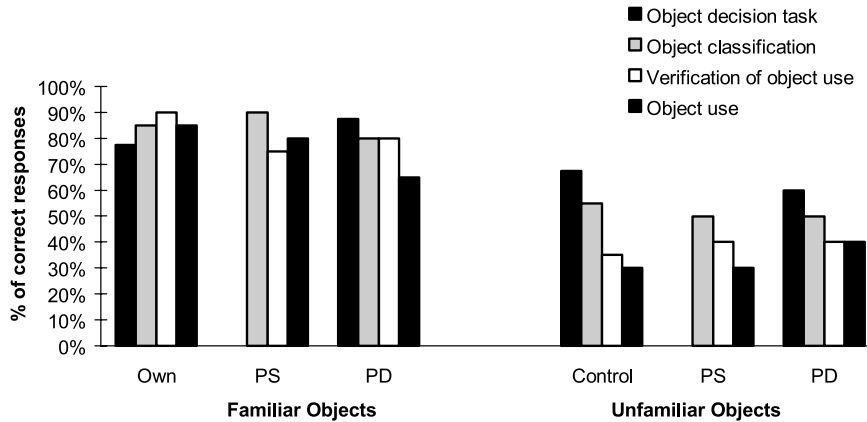E-mail address: agnesa.pillon@psp.ucl.ac.be (A. Pillon).

Fig. 1. MJB's performance in the tasks probing object knowledge for the three exemplars of Familiar and Unfamiliar objects (PS=Perceptually Similar; PD=Perceptually Dissimilar).

Verification of object use

For each object, the examiner showed once its correct use and once an incorrect use (i.e., the use that was correct for a closely related object). The patient was asked to tell whether the use was correct or not. An item was scored as correct when the patient both accepted the correct use and rejected the incorrect one. MJB performed better for Familiar than for Unfamiliar objects ($\chi^2_{(1)} = 23.47$, $p < .0001$) but no significant difference was observed between the three sets of Familiar ($\chi^2_{(2)} = 1.55$, $p = 45$) or Unfamiliar objects ($\chi^2_{(2)} < 1$).

Object use

The patient was asked to demonstrate the use of the objects. Performance was videotaped for later evaluation by two independent scorers. Familiar objects were used more appropriately than Unfamiliar objects ($\chi^2_{(1)} = 22.76$, $p < .0001$) and no significant difference was observed between the three sets of Familiar ($\chi^2_{(2)} = 2.42$, $p = 29$) or Unfamiliar objects ($\chi^2_{(2)} < 1$).

Conclusion

The results of this case study do not conform to the expectations derived from the "semantic-like" account for residual object knowl-edge in semantic dementia. Clear evidence was found that MJB was able to generalize the knowledge underlying the appropriate use of her own objects to new instances of the same objects. Under the assumption that the ability to generalize knowledge appropriately for different but related exemplars of objects is the hallmark of semantic knowledge, this finding shows that the patient has residual *semantic* knowledge for the objects she continues to use frequently. The effect of object familiarity observed in all the tasks is consistent with the view that conceptual representations of objects having high premorbid or/and current familiarity are relatively resistant to the progressive semantic deterioration observed in semantic dementia.

References

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