Are verbs like inanimate objects?

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Introduction

One of the most compelling findings in aphasic research is that neurological impairment may affect words of one grammatical class more than others, for instance, verbs more than nouns (e.g., Miceli, Silveri, Villa, & Caramazza, 1984; McCarthy & Warrington, 1985) or vice versa (e.g., Bates, Chen, Tzeng, Li, & Opie, 1991; Zingeser & Berndt, 1988). The underlying mechanisms of such grammatical dissociations are controversial.

Bird, Howard, and Franklin (2000) recently proposed a model attributing the noun/verb dissociation to the conceptual system, based on the influential sensory/functional theory (SFT) (e.g., Warrington & McCarthy, 1987). SFT assumes that concepts are represented in the brain by different types of features, such as sensory and functional ones; the concepts of animate things have higher proportion of sensory features than the concepts of artifacts (inanimates) do, and artifacts have higher proportion of functional features than animates do. Damage to sensory features will result in more severe deficits to animates, and vice versa. Bird et al. (2000) extended SFT to the domain of verbs, proposing that the sensory-to-functional ratios for verbs are even smaller than that for artifacts. They further argued that a deficit in the processing of nouns may be attributed to damage of the sensory features. An important prediction made by this theory is that patients who exhibit a noun deficit should also be more impaired with animates than with artifacts within the noun domain. Here, we report a case that allows a direct test of the central prediction of this theory. Our patient, ZBL, was more impaired in noun-naming than in verb-naming, but was better with animates than with artifacts.

Case report

ZBL is a 50-year-old right-handed man with high school education, who formerly worked in a company in Beijing. He suffered from the first stroke in October 1997, and a second one in that December. A MRI showed a lesion in the territory of the left posterior cerebral artery, involving the occipital lobe and extending into the medial surface of the left temporal lobe, and laterally into the temporal occipital junction. ZBL was perfect in repetition (40/40), auditory lexical discrimination (25/25), auditory word–picture matching (50/50), auditory sentence–picture matching (20/20), and auditory word lexical decision (20/20). Spontaneous speech was grammatical with word finding difficulties.

He was given two noun/verb picture naming tests where the names of object pictures and action pictures were matched on frequency, length, familiarity, and naming agreement ($ts < 1$). He correctly named significantly more verbs than nouns (Set 1: verb 26/34, noun 15/34, $\chi^2(1) = 7.43$, $p < .01$; Set 2: verb 24/30, noun 11/30, $\chi^2(1) = 11.59$, $p < .001$).

To examine potential categorical effect within the object (noun) class, ZBL was tested on the oral naming of Snodgrass and Vanderwart (1980) pictures. Overall there was a trend for better performance on animates than artifacts ($\chi^2(1) = 2.65$, $p = .10$). Two subsets were further constructed following the same procedure as in Funnell and Sheridan (1992) matching items in the animate and artifacts groups on frequency and familiarity values. ZBL was worse on artifacts than animates for both subsets: Set 1: $\chi^2(1) = 3.32$, $p = .06$; Set 2: $\chi^2(1) = 8.01$, $p < .005$. We further administered a Chinese adaptation of the "central attributes judgment task" (Caramazza & Shelton, 1998), which includes true or false statements tapping into sensory and non-sensory features of various kinds of items. Again ZBL performed better on questions with animates than on those with artifacts (119/143 vs. 115/158, $\chi^2(1) = 4.72$, $p < .05$). The results are summarized in Fig. 1.

Discussion

Our patient, ZBL, performed significantly worse on nouns (objects) than verbs (actions) in oral picture naming. According to Bird et al. (2000), this is due to impairments to the sensory features in the conceptual system, which are more important for noun concepts than for verb concepts. Furthermore, given that they also assumed sensory features to be more important for animate concepts than for artifact concepts, ZBL should also have shown greater difficulty with animates than with artifacts. Opposite to this prediction, we found that ZBL was better with animates than with artifacts in both oral naming and attributes judgment tasks. This case poses a direct challenge to the

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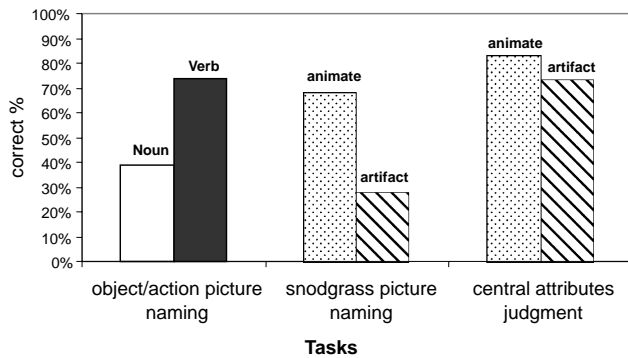*E-mail address:* ybi@wjh.harvard.edu (Y. Bi).

Fig. 1. ZBL's performance on picture naming and central attributes judgment tasks.

central assumption of Bird et al.'s (2000) proposal. It is clear that this particular theory of attributing the grammatical class effect to the impairment of sensory features in the conceptual system is not adequate to account for all cases of noun/verb dissociations (see Laiacona & Caramazza, 2004, for further discussion).

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