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RESEARCH LETTER

A domain-specific deficit for foodstuffs in patients with Alzheimer's disease

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INTRODUCTION

Although some studies have reported a category specific naming deficit in Alzheimer's patients (invariably for living things), others have failed to replicate this finding (Laws et al., in press). Inconsistencies may partly stem from the fact that category effects are hidden in group analyses because individual Alzheimer's patients show category deficits in opposing directions, namely, some living and some nonliving (Gonnerman et al., 1997). Additionally, category effects may depend upon the specific composition of living things, such as the ratio of animals to fruits and vegetables, though this has never been explicitly examined. To examine this, we conducted a more detailed fractionation of living and nonliving categories for individual patients.

RESEARCH PARTICIPANTS

This study included 18 patients (14 female; 4 male; *M* age = 77.5 ± 7.5) with probable Alzheimer's dementia. Their mean MMSE (Folstein et al., 1975) was 18.03. All patients were living at home and visiting a day-center.

Twenty-six normal subjects (12 female; 14 male; *M* age = 72.35 ± 4.9) were recruited through their general practitioner, who screened them for good health. They had no history of head injury, neurological or psychiatric illness, and alcohol or drug abuse. English was the first language in all participants.

MATERIALS AND PROCEDURE

Participants viewed 120 color images from the Category Specific Names Test (McKenna, 1997) comprising 60 living and 60 nonliving things presented in order of normative naming difficulty. These consist of 30 fruits and vegetables; 30 animals; 30 praxic objects (objects with a specific associated action, e.g., *darts*); and 30 nonpraxic objects (objects with no specific associated action, e.g., *calendar*). The stimuli were matched across category for familiarity and name frequency.

RESULTS

Analysis across category revealed no difference between living and nonliving naming for either the Alzheimer's patients (14.78 ± 10.25 *vs*. 12.94 ± 9.65; $F < 1$) or the healthy controls (44.57 ± 7.2 *vs*. 44.92 ± 5.03; $F < 1$).

The four subcategories (*M*s and *SD*s for patients and controls are detailed in Table 1) were analyzed for differential deficits using a method developed by Crawford and Garthwaite (2002). This estimates the abnormality of the difference between an individual's score on one test with the mean of the individual's score on a series of *k* tests (in this case, three other subcategories). The measure also estimates the percentage of the population that would obtain a more extreme discrepancy (and provides 95% confidence limits on this measure). This analysis was conducted using gender- and age-matched control data. For documenting a differential deficit, we used the criterion that less than 5% of the normal population would be estimated to achieve a discrepancy score below that of the patient (see Table 2).

Table 1. Naming scores for Alzheimer's patients and elderly controls across the four subcategories

Subcategory	Alzheimer's patients ($n = 18$) $M \pm SD$	Elderly controls ($n = 26$) $M \pm SD$
Fruit and Vegetables	8.00 ± 5.73	22.65 ± 4.31
Animals	6.78 ± 5.86	21.38 ± 4.76
Praxic	6.39 ± 5.25	23.62 ± 3.91
Nonpraxic	6.56 ± 4.67	20.77 ± 3.23

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Table 2. *Z*-score discrepancies from patient's mean *z* score

Patient	Fruit and vegetables	Animals	Praxic	Nonpraxic
1	−0.86	2.24	−0.51	−1.08
2	−0.76	4.08	−2.25	−1.39
3	−2.36*	3.20	−0.62	−0.36
4	2.36	−0.65	−1.88	0.21
5	−4.94**	3.49	0.46	1.06
6	−1.53	0.79	1.43	−0.81
7	−4.40**	4.02	−0.60	1.02
8	0.54	1.86	−1.56	−1.05
9	−4.25**	3.90	−0.07	0.39
10	−3.42**	1.89	0.37	1.29
11	−3.40**	2.58	−1.06	2.11
12	−1.51	2.15	−2.00	1.49
13	−4.06**	4.35	−0.72	0.37
14	−4.56**	4.26	0.38	−0.22
15	0.44	1.74	−0.81	−1.64
16	−0.38	2.14	−0.86	−1.11
17	−2.59*	2.43	−0.35	0.52
18	−1.52	0.08	1.36	0.10
Mean	−2.06	2.47	−0.52	0.05

**Difference score occurs in <1% of the normal population.
*Difference score occurs in <10% of the normal population.

Fifty percent of patients had differential deficits for fruits and vegetables (19/18 patients), namely, they were significantly more impaired on this one subcategory than the others (although they may have been impaired on all). In fact, 7 patients had differential deficits that would be represented in less than 1% of the normal population (the remaining 2 scored <10%). By contrast, no patients showed a differential deficit for naming of animals. Indeed, for animals, the naming difference score in 14/18 patients was above the 95% difference score for normal elderly subjects. For nonliving things, 3 patients had borderline deficits for praxic objects; none were impaired for nonpraxic items.

DISCUSSION

Although we failed to find a general deficit for the category of living things, a finer analysis of living things into fruits and vegetables *versus* animals revealed a high deficit incidence for the former and no deficits for the latter (indeed animals were relatively intact). This suggests that, in the living thing category *per se*, better patient naming of animals compensates for their poorer fruit and vegetable naming.

Turning to the discrepancy between fruits/vegetables and other living thing categories, one possible explanation for this, is the modulatory effect of color. Although different tokens of the same type of fruit (e.g., compare different examples of strawberry, carrot, tomato) can have quite different shapes, their color tends to be less variant and more diagnostic (Laws & Ahktar, in press). The interaction of visual variables (e.g., shape, color) and different levels of categorization may underlie some of the more unusual cases of category specificity; for example, where animals doubly dissociate from fruits and vegetables (Hart et al., 1985; Hillis & Caramazza, 1991). One possibility is that Alzheimer patients suffer some greater difficulty with differentiating similarly shaped items on the basis of color. Indeed, recent studies have shown that young children (Macario, 1991) and even rhesus monkeys (Santos et al., 2001) show a preference or bias for categorizing food objects according to color rather than shape. This strongly indicates domain-specific processing for foodstuffs and the data reported here, highlights a differential impairment of this domain in Alzheimer's disease. Given these data and the rationale for such a differentiation, it is important for future studies of category effects to separate analysis of animals on the one hand from that for foodstuffs on the other.

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