

# Category specific impairments in recognition and naming

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Category specific impairments in recognition and naming: fact or not?

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Question: What's black and white and looks like a horse?

Answer: Hmmmmm..... a black and white horse?

Question: What do you call a guy who can't tell the difference between an apple and a barn?

Answer: Uhhhh.... what's the name for a thing with two legs, two arms and a head and, well, they look familiar... they are, like, everywhere... oh, I give up...

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Introduction to a Both Sides of an Issue

In the above riddles the answers may seem strikingly obvious *almost* anyone. That is, anyone except what is termed " semantic impairments" in which there is a marked disability of the individual to pair up the meaning of what they see (visual semantic disorders), hear (auditory semantic disorders) or even touch (tactile semantic disorders) with the ability to identify the object. This represents essentially a disconnection between what a person *knows* and what they can readily *express* . As there are numerous specific documented cases such as those studied in Capitani, Laiacona, Mahon & Caramazza's review of 79 patients for the purpose of assessing the ' division' line of the impairment with regards to specific semantic categories such as "

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animate/living” and “ inanimate/artifact”-type items (Capitani, Laiacona, Mahon, & Caramazza 2003, p. 213).

In a different setting, Tyler and Moss present the interesting case of “ DrO”, a 61-year old male who suffered particular deficits with regard to abstract words (i. e., love, hope, trust vs. concrete words such as bird, cup, etc.) following a cerebro-vascular incident. This study thoroughly details a number of testing procedures to compare his abilities to a group of peers as well as significant data in regards to his perceptual acuities such as hearing and vision. In their investigation, these utilize DrO as a literal test bed against the various theories regarding ‘ traditional’ category-specific deficit disorders and the way that words and ideas might be encoded into memory. In the end, though DrO *looks* like a “ classic” case of category-specific deficit, the researcher conclude that it is more likely to due an auditory ‘ input’ problem in which they endorse the model proposed by Plaut & Shallice in which concrete words are posited to have greater semantic features, that is, they are easier to ‘ grab on to’, and thus typically evidence faster recall and recognition (Tyler & Moss, 1997, p. 315).

Though it seems clear that cases exist which exhibit the phenomena of category-specific disorders, as the above example of the case of DrO indicates, things may not always be what they seem as it is not necessarily the *memory* that is at fault but more likely the ‘ connections’ that allow one to have full mastery of the information stored in one’s own brain.

In Support of Category Specific Disorders...

To begin, one must understand that the brain is essentially a storage bin of some sort for intangible inputs and outputs. The real trick of the matter is to know the nature of the bins... specifically, how are they divided and how do they function? What is the hierarchy or taxonomy of stored sensory information? Are experiences broken down into the different sensory components? Is it stored chronologically? Most of these eclipse the current state of knowledge yet, by carefully observing the output, an idea can be formed about how the system might work. It is by these means that the idea of a category-specific impairment came to be when researchers noted, in 'normal' subjects, a difference in picture identification between natural objects and other artifacts suggesting that memories were stored or accessed according to some categorical hierarchy (Humphreys, Price & Riddoch, 1999, p. 118). Issues such as these manifest themselves in the classic 'naming difficulty' tests such as the patient who was presented with a picture of celery and responded, "...it is green and you have it as a main course... I dip it in salt". This type of response, in which the subject demonstrated extensive knowledge *about* the object, was heard numerous times as the issue of category-specific impairment certainly seemed to be a logical explanation that fit the theory of memory in which data is separated and stored in logical "bins" to retrieve on cue later (Humphreys, Price & Riddoch, 1999, p. 122).

Operating under the assumption that such a disorder exists, one interesting aspect that the categories while logically infinite seem to limit themselves to a comparatively very few key groups: biological categories (possibly

subdivided into ‘ animals’), food (often fruits & vegetables) and artifact-type items with musical instruments a popular sub-category (Capitani, et al. 2003, pp. 225, 235-244). In terms of the type of impairment reflecting the proposed model, the most frequently occurring impairment has exhibits a disability to retrieve information related to the properties of an object or its associative knowledge of the item in a given category (Capitani, et al. 2003, pp. 228-229). One potential rationale for the division of categories is the within-category similarity of items. For example, categories such as “ musical instruments” or “ animals” have a greater perceived degree of within group similarity than categories such as “ jewelry” or “ beverages”. Accordingly, this same justification can be utilized to rationalize the breakdown of particularly large heterogeneous categories such as “ animate/living” (Sartori & Lombardi, 2004, pp. 441-442, 446). Additional insights are provided when one observes impairments in items that have both “ functional” and “ perceptual” qualities such as would be the case in which deficits were observed in both musical instruments *and* living objects, thus defying the heretofore idea that deficits were limited to semantic ‘ categories’. Based upon these findings, it has been hypothesized that the perspective of perceptual attributes are primary memory sorting parameters and then category-specific attributes (i. e., living vs. non-living) play a potential secondary role (Devline et al. 1998, pp. 77-78). Also, the idea that categories such as “ living things” are stored/recalled by *perceptual* attributes while inanimate objects are stored/recalled by “ functional” attributes, thereby establishing a fit for perceptual and functional priorities (Berndt, 2003 , p. 101).

A popular understanding of the brain is that functions are laid out ‘topographically’ such that differing item attributes are focused in different physical locations in the cortex. Though it may seem overly simplistic, there is research to support a topographical model as evidenced by imaging studies that have demonstrated a different location of activity for living versus non-living items (Humphreys & Riddoch, 2003, p. 263). Consistent with the topographical view is the “sensory/functional theory” one of the early hypotheses on how memory ‘works’ with regard to category-specific impairments. According to this theory, experiential data is organized in the brain by sensory modality and, secondly, that the primary differentiation in stimuli is determined by its sensory or perceptual properties and by its functional attributes (Caramazza & Shelton, 1998, p. 4).

Despite some support, a problem with these models occurs in the cases of non-focal, widely distributed lesions such as those produced by Alzheimer’s or Herpes simplex encephalitis patients have produced the same type of category-specific deficit as would be expected with a highly localized lesion (Devline et al. 1998, p. 78). In attempting to explain cases from this theoretical perspective, category-specific disorder cases similar to DrO in which the problem was believed to be an ‘input’ or ‘processing’ failure, a key factor is that the impairment should not be mode-specific in that the issue should reside at the “semantic” node from which all inputs and outputs pass. That being the case, for a case to be a ‘real’ category-specific disorder, the problem should be isolated to instances in which the stimulus is

presented not just in a solely audible or visual form (Caramazza & Shelton, 1998, p. 13).

### Explaining Things

Based on the existence of category-specific disorder, Humphreys and Riddoch began to seek to postulate a model that would explain the myriad complexities of both normal and deviate cases. Extending from the information presented previously on the division of categories, researchers suggest that perceptual and functional memory associations are recalled by correlated perceptual features. For example, “ has a trunk” is likely to be highly correlated with an elephant whereas “ has four legs”, while quite accurate, does not exude the same strength as the previous descriptor (Sartori & Lombardi, 2004, p. 439; Humphreys & Riddoch, 2003, p. 265). This model is referred to as the “ distributed semantics” model as a consequence of the features of memory being stored in numerous ‘ places’. Taking this model a step further, Humphrey and Riddoch proffer the Hierarchical Interactive Theory (HIT) the allows the use of a flexible (but fairly standard) method of categorization by individual. In this model, there is a hierarch of processing levels that include, “ the structural description system through to the semantic representations [functional attributes]... or names”. With such a structure, one the means by which it differs from the distributed semantics or other models is that is acknowledges ‘ up-front’ that processing can occur at level rather than a fixed ‘ processing spot’ (Humphreys & Riddoch, 2003, pp. 266-267).

In summary, though memory is, at best, only a partially understood concept, the existence of disorders such as category-specific impairments provide researchers with both a challenge and the key to solving a portion of the puzzle. By understanding the dynamics of what can happen when the system is 'working right', one has the opportunity observe the differences.

#### Works Consulted

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