

Category-Specific Verb Deficits in Alzheimer's: Argument structure effects in naming and sentence production with dynamic scenes

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Semantic Deficits in Alzheimer's

- Several studies have found that individuals with probable Alzheimer's disease (pAD) have impaired knowledge for categories of objects, which are lexicalized by **nouns**. (e.g., Zannino et al., 2002).
- Deficits in categories lexicalized by **verbs** (e.g., **events** and **states**) has been more difficult to characterize.
- Relatively few studies have investigated verb semantic deficits in Alzheimer's
- These studies differ considerably both in terms of verb classes investigated and methods employed (e.g., Grossman et al., 1996; Kim & Thompson, 2004; Manouilidou et al., 2009).

Current Study

- Our goals were to understand (a) how different syntactic & semantic classes of **verbs** might be affected in Alzheimer's; and, consequently, (b) which principles underlie verb classifications.
- pAD patients and controls named and generated sentences describing actions depicted in video clips representing **verbs said to form three classes**.

Verb Classes Investigated

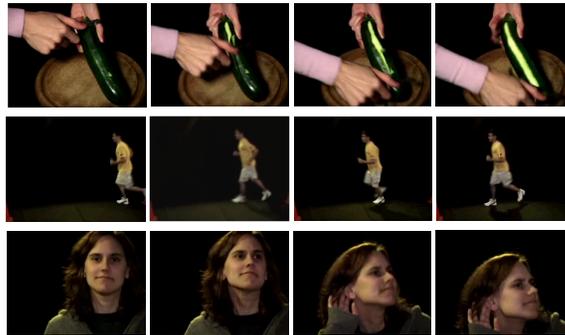
- Verb classes varied along three hypothetical dimensions:
 - argument structure**: number of arguments
 - thematic roles**: semantic roles assigned to arguments
 - semantic templates**: internal semantic properties of verbs (e.g., Jackendoff, 1990; Levin & Rappaport-Hovav, 2005).
- Lexical causatives** (e.g., *peel*), hypothesized to be semantically more complex (multiple internal predicates: $[[x \text{ ACT}] [\text{CAUSE} [\text{BECOME} [y < \text{PEELED} >]]]]$) and structurally complex (two arguments: x and y)
- Verbs of perception** (e.g., *hear*), are structurally complex (two arguments) but semantically simple (one predicate: $[x \text{ PERCEIVE } y < >]$)
- Verbs of movement** (e.g., *run*), are semantically and structurally simple ($[x \text{ MOVE} < >]$; one argument).
- These verbs also differ with regards to the **thematic-role hierarchy**: **causatives** and **movement** verbs assign the most prominent *Agent* role to the x argument; in **perception** verbs, the *Experiencer* role is assigned to x (e.g., Grimshaw, 1990; see de Almeida & Manouilidou, 2015).

Method

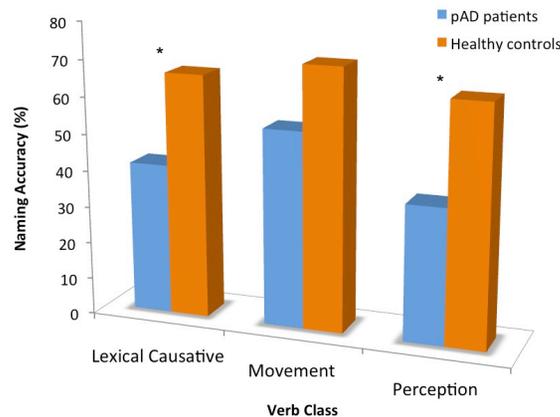
Participants: Action naming: 19 pAD patients (mean MMSE = 24.4) and 29 age and education matched healthy controls (mean MMSE = 29.6); **Sentence Production:** 16 pAD patients (MMSE = 24.6), 21 controls (MMSE = 29.3).

Materials & Procedure:

- Dynamic Action Naming task:** 34 short movies of events probing three classes of verbs. Participants were asked to **name, using one word, the action depicted in the movie**.
- Dynamic Sentence Production task:** same 34 short movies of. Participants were instructed to **produce a sentence describing the action depicted in the scene**.

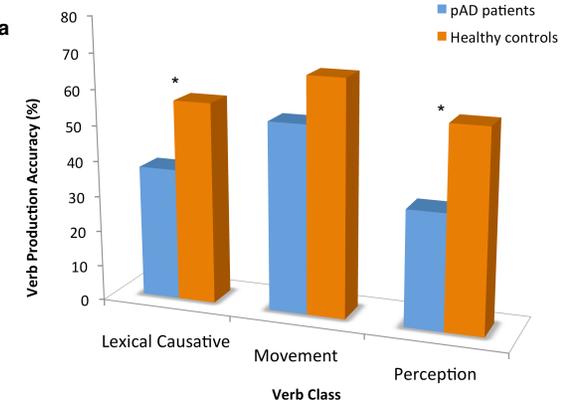


Sequences of frames from movies representing the three verb classes used in the experiment (from top): **causative (peeling), movement (running), and perception (listening)**.



Dynamic Action Naming Task: Results

- Main effect of group** $F(1, 26) = 18.96, p < .0001, \eta_p^2 = .422$
- One-way ANOVAs revealed category-specific verb deficits for **causatives** ($F(1, 26) = 6.21, p = .02$) and **perception** verbs in pAD patients, $F(1, 26) = 10.65, p = .003$.



Dynamic Sentence Production Task: Results

- Main effect of group** $F(1, 26) = 21.35, p < .001, \eta_p^2 = .451$.
- Main effect of verb class**, $F(2, 52) = 3.46, p = .039, \eta_p^2 = .117$.
- One-way ANOVAs revealed category-specific verb deficits for **causatives** ($F(1, 26) = 4.41, p = .046$) and **perception** verbs in pAD patients, $F(1, 26) = 11.44, p = .002$.

Discussion

- ✓ Probable Alzheimer's disease patients have more **difficulty with causative and perception verbs**.
- ✓ These data suggest that verb argument structure might be affected in AD; this could also be an effect of thematic structure
- ✓ Similarly to Agrammatic speakers, pAD patients seem to have problems with verbs with **more complex argument structures**
- ✓ This is at least in part consistent with the *Argument structure complexity hypothesis*. (Thompson, 2003)
- ✓ Verb-semantic deficits do not seem to be predicted by template complexity, i.e., by the number of hypothetical internal predicates (the likes of *CAUSE* and *BECOME*).
- ✓ Consistent with other studies employing imaging and groups of patients, verbs may be represented in the brain by their argument structures.

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