Cognitive animacy perceptions and the animacy hierarchy

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Typological research [1, 2] has observed that where human languages make grammatical distinctions among nominals, they respect the *animacy hierarchy* (1). For example, in differential object marking (DOM), humans will pattern with non-human animates rather than inanimates. Although the animacy hierarchy was thought to derive from cognition, linguistic research has instead focused on formalizing it in terms of privative features [3]. But which nouns are [ANIMATE]? For English, human referents are assumed to be [ANIMATE], receiving *he/she* pronouns, while non-humans are not and receive *it*. However, this does not provide a principled account as to *why* nouns are [ANIMATE]. There are intuitive counterexamples (e.g. babies can be referred to as *it*, dolls as *he/she*), and animals vary in pronoun assignment. There is also no principled justification as to why the animacy hierarchy is ordered as it is.

One account of animacy in English is that it functions like grammatical gender, and category exceptions are idiosyncratic, though understandable with cultural and historical knowledge [4, 5]. We propose an alternative account: nouns differ from category-based expectations in predictable ways based on their conceptual properties. In a norming experiment, we tested whether properties associated with cognitive animacy predict pronoun animacy [6–10]. We found that English pronoun animacy closely tracked perception of cognitive animacy, consistent with theories in which [ANIMATE] and the animacy hierarchy derive from gradient representations of entities in cognition.

Methods: Prior work [6] on perceptions of English nouns found correlations among cognitive animate properties: LIVING, THOUGHT, REPRO(DUCTION), PERSON(HOOD), GOALS, and MOVE(MENT), with emergent groupings of mental animacy (THOUGHT, PERSON, GOALS) vs. physical animacy (LIVING, REPRO, MOVE). First, we tested whether these properties correlated with linguistic animacy, i.e. pronoun acceptability. Participants (n = 79) rated 362 nouns for PRONOUN (1–7 Likert from *it* to *he/she/they (sg)*); see **Fig. 1**. We also noted that the original PERSON rating asked participants to rate nouns for "similarity to a person" without anchoring the lower end of the scale, i.e. what would be dissimilar from a person. To increase the informativity of this metric, we had another set of participants (n = 79) provide THING-TO-PERSON ratings, 1–7, where 1 denoted "similar to a *thing*" and 7 denoted "similar to a *person*".

Results: Leveraging the animacy ratings collected in [6], we found that all the previous scales were correlated with PRONOUN (**Figs. 2–3**). We analyzed the data using an ordinal mixed-effects regression model with stepwise model selection in order to assess which properties are most relevant to animacy perception. CATEGORY (Human, Animal, Thing, or Other), THOUGHT, REPRO, GOALS, MOVE, and the newly collected THING-TO-PERSON ratings were significant predictors of PRONOUN (ps < 0.02) (**Fig. 4**). With CATEGORY taken into account, LIVING was not a significant predictor. With THING-TO-PERSON taken into account, the original PERSON rating was not a significant predictor (although the two were highly correlated, r = 0.97). In fact, THING-TO-PERSON was the most predictive factor of PRONOUN (**Fig. 3**). The results indicate that cognitive animacy properties are predictive of pronoun animacy in English, over and above the effects of category-based heuristics.

Conclusion: We investigated the role of cognitive animacy in predicting English pronoun animacy. Our findings support a strong interplay between cognitive and linguistic animacy [11]. We further quantified the differential contribution of cognitive animacy properties; mental properties like thought and volition, along with overall personhood, appear to be especially important in determining pronoun animacy. Although category-based heuristics may play a role, English pronoun animacy depends largely on perceptions that transcend categories. We propose that animate features in the grammar derive from gradient conceptual properties such as those examined here, deriving key aspects of the animacy hierarchy. To evaluate whether similar conclusions hold cross-linguistically, a comparable study is being conducted on Mandarin. In sum, these studies motivate a deeper connection between the perception of animacy and its expression in the grammar, at least as codified in pronoun choice.

(1) *Animacy hierarchy:* speech-act participants > kin > human > animate > inanimate

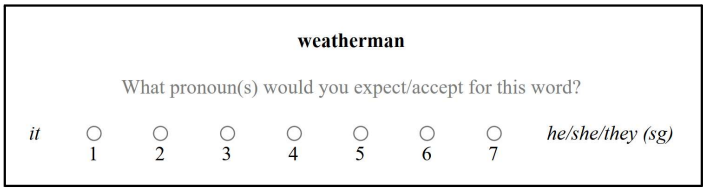


Fig. 1: Example of the pronoun rating task.

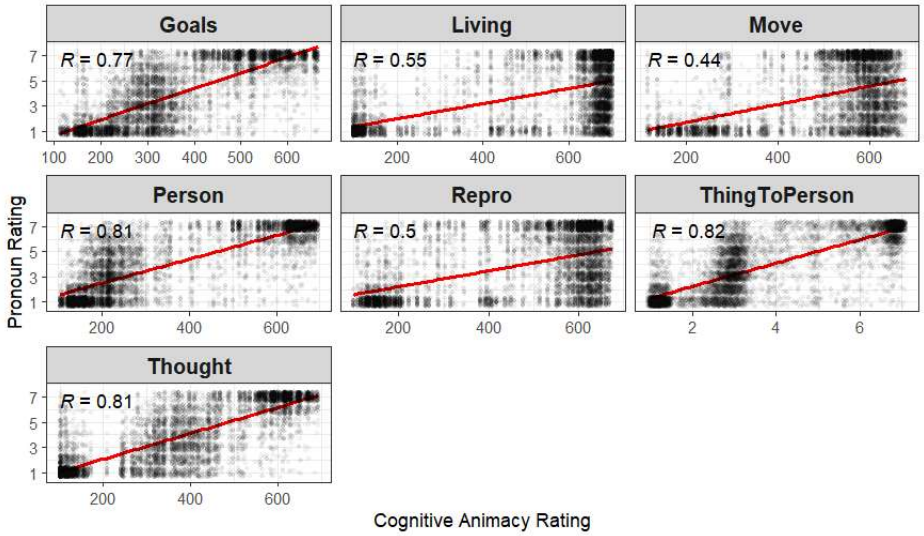
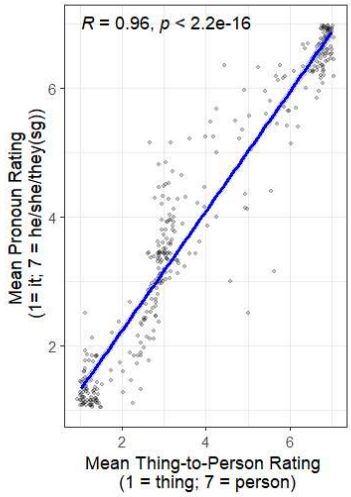


Fig. 2: Scatterplots of PRONOUN rating and cognitive animacy ratings with regression lines. THING-TO-PERSON ratings were collected on a 1–7 scale, while all other ratings (from [6]) were 100–700.



	Estimate	SE	t	p
threshold.1	-2.570	0.098	-26.24	0.000
spacing	1.017	0.014	72.35	0.000
Animal vs. Human	1.078	0.186	5.80	0.000
Thing vs. Animal	-0.238	0.164	-1.45	0.147
Other vs. Thing	-0.166	0.163	-1.02	0.308
Thought	0.569	0.096	5.93	0.000
Repro	-0.285	0.062	-4.60	0.000
Goals	0.155	0.064	2.43	0.015
Move	0.312	0.037	8.36	0.000
ThingToPerson	2.786	0.126	22.06	0.000

Fig. 3 (*left*): Mean PRONOUN and mean THING-TO-PERSON rating for each noun.
Fig. 4 (*right*): Ordinal mixed-effects regression model of PRONOUN in terms of animate properties; the model shown is the best fitting model created by performing backward stepwise elimination on the maximal model. CATEGORY is forward-difference contrast-coded (e.g. Animal vs. Human).

References: [**1**] Silverstein (1976). Hierarchy of features and ergativity. [**2**] Corbett (2000). *Number*. [**3**] Toosarvandani (2023). *Language*. [**4**] Corbett (1991). *Gender*. [**5**] Aikhenvald (2025). *A Guide to Gender and Classifiers*. [**6**] VanArsdall & Blunt (2022). *Mem. Cog*. [**7**] Scholl & Tremoulet (2000). *Trends CogSci*. [**8**] Gao, Scholl & McCarthy (2012). *J. Neurosci*. [**9**] Gergely & Csibra (2003). *Trends CogSci*. [**10**] Gelman & Spelke (1981). The development of thoughts about animate and inanimate objects. [**11**] Trompenaars, Kaluge, Sarabi & de Swart (2021). *Lang. Sciences*.