

Informativeness Guides the Selection of Basic-Level and Superordinate Verbs

Ruidi Huang (ruidih@sas.upenn.edu), Isabelle Chapman (izzyrc@sas.upenn.edu)
& Anna Papafragou (anna4@sas.upenn.edu)
Department of Linguistics, University of Pennsylvania

Abstract

Classic work on categorization has documented a robust preference for basic-level over superordinate labels, shaped by multiple factors including conceptual organization and pragmatic expectations of informativeness. However, it remains unclear whether similar expectations guide the evaluation of verb descriptions, whose semantic organization is less taxonomically stable and more context-dependent. In two experiments, we investigated adults' pragmatic evaluation of basic-level versus superordinate verbs. Experiment 1 showed that superordinate verbs (e.g., in "a woman is *moving*") were systematically rated lower relative to basic-level alternatives (*running*) when describing actions, despite being literally true. Experiment 2 demonstrated that this penalty was modulated by contextual relevance: superordinate verbs were judged more acceptable when visual contrast rendered them informative for identifying the target action, but remained dispreferred overall. These findings indicate that pragmatic expectations of informativeness extend to the verbal domain, while highlighting constraints imposed by conventional event construal and the flexible nature of verb abstraction.

Keywords: verb; superordinate; informativeness; relevance; pragmatics

Introduction

When describing objects or events, speakers must choose among multiple possible linguistic descriptions that differ in their level of abstraction. A central question in cognitive science concerns how such choices are guided by conceptual organization on the one hand, and pragmatic considerations such as informativeness and relevance on the other. While classic work has shown a robust preference for basic-level descriptions in object naming (see next section), much less is known about whether similar principles govern speakers' choices among alternative verb descriptions. The present study addresses this gap by examining how pragmatic expectations of informativeness shape the acceptability of basic-level versus superordinate verbs.

The Basic-Level Bias in Object Naming

Classic work on categorization has demonstrated a robust "basic-level" bias in object naming: speakers overwhelmingly prefer basic-level labels (e.g., *dog*, *chair*) over more abstract superordinates (e.g., *animal*, *furniture*)

and more specific subordinates (e.g., *dalmatian*, *kitchen chair*; Rosch, 1973; Murphy, 2002). Across a series of experiments, Rosch and colleagues argued that basic-level categories occupy a privileged position in conceptual organization, insofar as they maximize within-category similarity while preserving between-category distinctiveness (Rosch et al., 1976). Such categories were shown to be cognitively salient across tasks involving categorization, recognition, and feature listing, suggesting that they play a central role in how objects are mentally represented.

Although the basic-level bias is robust, subsequent work has shown that it is not an absolute constraint on how words are used or interpreted. This flexibility was first established by classic research into the roles of expertise and typicality. Tanaka and Taylor (1991) demonstrated that the "basic" level is highly plastic, showing that experts identify subordinate-level objects (e.g., *Robin*) at the same speed as basic-level ones (e.g., *bird*), suggesting that the hierarchy reflects experience rather than a fixed architectural limit. Similarly, Jolicoeur et al. (1984) found that, for atypical category members, the mind bypasses the basic level entirely in favor of a more distinctive "entry-level" subordinate term. Developmental studies also provide supportive evidence for such flexibility (e.g., Lewis & Frank, 2018; Wang & Trueswell, 2019, 2022).

A powerful explanation for this flexibility comes from pragmatics (Grice, 1975). Under the Gricean framework, speakers are expected to provide as much information as is required for the current communicative purpose, but no more than is necessary (the Maxim of Quantity). Intuitively, basic-level labels are preferred in many contexts because they provide an optimal balance of informativeness: a superordinate label is often too vague, whereas a subordinate label may provide superfluous detail. However, in contexts where either broader generalizations or finer distinctions are necessary for successful communication, the basic level is no longer optimal. In such cases, speakers and listeners flexibly shift their lexical expectations to meet the specific informational demands of the environment.

In accordance with this perspective, classic studies demonstrated that the basic-level bias can be overridden through semantic anchoring: pairing a familiar basic-level label with a subordinate one (e.g., "This is a dog; it is a Dalmatian") enables interlocutors to successfully coordinate on more specific interpretations (Callanan, 1989). Building

on this insight, more recent research shows that real-time lexical selection is sensitive to the availability of relevant alternatives in the discourse. Choe and Papafragou (2023) found that introducing even a single labeled subordinate-level alternative eliminates the basic-level bias, suggesting that the presence of competing labels signals a shift in the level of informativeness required for the communicative goal. Related evidence from the “suspicious coincidence” effect further indicates that listeners interpret a speaker’s use of specific terminology as a deliberate communicative choice, rather than a random one, consistent with Bayesian models of pragmatic inference (Xu & Tenenbaum, 2007; Lewis & Frank, 2018).

Together, these findings move beyond accounts grounded in static category structure, highlighting the role of pragmatic inference in a dynamic process of lexical selection, in which interpretations are continuously updated based on the informativeness of words relative to the contextual alternatives (see also Wang & Trueswell, 2019).

A Basic-Level Bias in Verbs?

At present, it is an open question whether and how the basic-level bias and its pragmatics operate over verbs. This question is nontrivial, given that verbs differ from nouns in their semantic organization and may not form tidy hierarchies (Levin, 1993) but rather networks of related meanings. In the nominal domain, a dog is always an animal. By contrast, “superordinate” verbs often represent looser, context-sensitive generalizations: while *teaching* is usually a form of *working*, or *singing* a form of *performing*, these relations are not logically absolute. Even seemingly hierarchical pairs like *move* and *run* can be difficult to map onto a stable scale because their precise meanings depend heavily on context and polysemy. Consequently, verbs do not always form the kind of coherent, context-insensitive hierarchies found in the nominal domain.

Nevertheless, speakers must still choose between verbs of varying specificity (e.g., *move*, *run*, *sprint*). Even if not governed by rigid logical scales, these choices can be evaluated relative to pragmatic expectations of informativeness and relevance (see Horn, 1972, on ‘ad hoc’ scales). This raises the question: is there a communicative preference for “middle-ground” or quasi-basic-level verbs, even in the absence of a strict hierarchy?

Recent evidence suggests that action concepts may indeed possess a privileged level of abstraction. Mirroring the classic methods of Rosch et al. (1976), Zhuang and Lingnau (2022) examined action naming and categorization across three levels in German (e.g., *sich fortbewegen*, “to move”; *fahren*, “to drive”; *Auto fahren*, “to drive a car”). Across six experiments, they found that basic-level actions mirrored the basic-level advantage seen in objects: they elicited the highest proportion of common features, supported faster and more accurate recognition, and served as the most abstract level that reliably facilitated visual processing. Building on these behavioral findings, Zhuang et al. (2023) conducted a neuroimaging study demonstrating that these hierarchical

levels are distinctively represented in the brain, mirroring conclusions established in the object domain (e.g., Connolly et al., 2012; Jordan et al., 2015).

Currently, much remains unknown about the organization of verbs along linguistic hierarchies and the ways interlocutors choose and evaluate them in communication. Of course, other lines of work have investigated how conceptual and pragmatic factors influence speakers’ encoding of events in verbs and other linguistic devices (e.g., Do et al., 2020). Crucially, these lines of research primarily address how speakers distribute information within and beyond the verb rather than how they select among competing verbs. Here, we seek to fill this gap by investigating the mechanisms that drive the choice between more general or more specific action labels during ongoing conversation.

The Current Study

Across two experiments, we probed how pragmatic expectations of informativeness apply to the selection of action verbs. While taxonomic hierarchies typically include a subordinate level, the present study focuses specifically on the contrast between basic-level and superordinate labels. This choice is motivated by the distinct pragmatic relationships between these levels. In a Gricean framework, while subordinate terms involve the risk of providing superfluous information, superordinate terms involve the risk of being underinformative. We examined whether superordinate verb descriptions are underinformative, and thus typically dispreferred compared to basic-level descriptions in neutral contexts (Exp.1). We further investigated the flexibility of this preference, asking whether superordinate predicates become acceptable, or even preferred, when they satisfy specific contextual relevance demands, and conversely, whether basic-level verbs are penalized when they overspecify relative to those demands (Exp. 2).

Experiment 1

In Experiment 1, we investigated adults’ pragmatic sensitivity to informativeness in the verbal domain by manipulating the level of abstraction in event descriptions. Specifically, we contrasted a basic-level verb label (e.g., “A woman is running”) with a more abstract verb label that we treat as a superordinate (e.g., “A woman is moving”) for the same depicted action, presented in the absence of any contextual cues. We hypothesized that, when identifying an action for an uninformed addressee, speakers are expected to provide a sufficiently informative description given the conventional semantic ground shared by interlocutors. We predicted that a superordinate label should be judged as under-informative, though not false, when describing a single, clearly identifiable action. Experiment 1 tested this prediction using an adapted version of a paradigm previously employed in studies of pragmatic informativeness in nominal reference (Choe & Papafragou, 2025; cf. also Katsos & Bishop, 2011).

Participants Forty English-speaking adults were recruited from the undergraduate pool at the University of Pennsylvania. Sample size was determined based on an earlier study that used this paradigm with nouns (Choe & Papafragou, 2025).

Procedure The experiment was administered via the Qualtrics platform for web-based experimentation (Provo, UT). All participants were tested remotely on their own computers. At the beginning of the experiment, participants were told that they would be playing a game of “I-Spy” with a cartoon character, Mr. Lion, who appeared on the screen (Figure 1). Participants were informed that Mr. Lion was “still learning his words” and that their task was to help him.



Figure 1: The display in a critical trial of Experiment 1. The cupcakes appeared after Mr. Lion had labeled the event.

After the introduction, participants were shown three cupcakes of different sizes (small, medium, and large), introduced as Mr. Lion’s favorite treats. Participants were then instructed on how to use these to give Mr. Lion feedback: “If Mr. Lion uses a wrong word, give him the small cupcake, so that he can do better next time. If Mr. Lion uses the best word, give him the large cupcake. If Mr. Lion uses a word that isn’t wrong, but it isn’t the best word, and you can think of a better one, then give him the medium cupcake.”

After confirming that they understood these instructions, participants began the main task. Each trial followed the same sequence: first, an action photograph appeared next to Mr. Lion. Then a pre-recorded audio clip played in which Mr. Lion described the action using either the basic-level verb (e.g., “A woman is running”) or the superordinate verb (e.g., “A woman is moving”). Immediately afterward, the cupcakes appeared at the bottom of the screen for participants to make their judgment. Based on past studies using this paradigm, we expected rewards to decrease in critical trials when a superordinate verb was used compared to a basic-level verb (specifically, we expected large-cupcake responses to reduce and medium-cupcake

responses to increase, as is often the case for true but underinformative descriptions).

We constructed eight superordinate-basic-level verb pairs for critical trials: *move - run*, *play sports - play basketball*, *decorate - paint*, *work - teach*, *play - skip*, *travel - fly*, *exercise - bike*, and *perform - sing*. In addition, rather than using the frame “This is V-ing” for labelling (as in past noun studies), we adopted a more naturalistic event-description frame (“A woman/man/girl/boy is V-ing”). Visual stimuli consisted of prototypical, high-resolution color photographs selected for each verb pair to ensure the depicted action was clearly recognizable and naturally described by both the basic-level and superordinate labels.

Participants completed eight critical trials and twelve fillers. Fillers included clearly true (n=6) and clearly false (n=6) statements about the name of a cartoon character (e.g., “This is Mario!”). All participants saw the same set of filler trials, counterbalanced across four item lists to rotate label type for the critical trials.

Results Mean accuracy on filler trials exceeded 90% for all participants, indicating high levels of engagement and successful comprehension of the task. Figure 2 shows the distribution of rewards for critical trials.

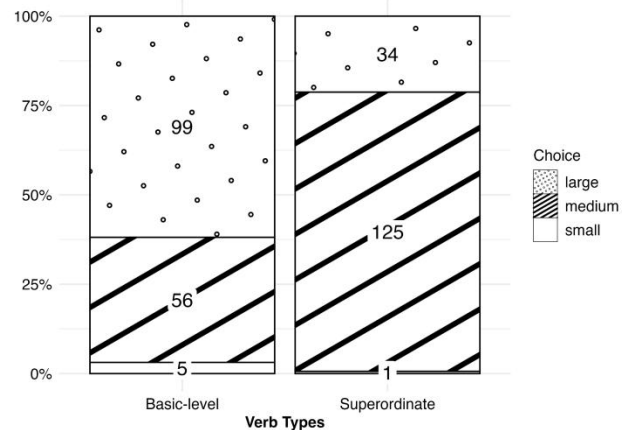


Figure 2: Experiment 1: distribution of rewards in critical trials. The large, medium, and small cupcakes correspond to the perfect, acceptable, and incorrect labels. (Raw numbers of responses are noted within bars.)

To statistically test the effect of Verb Type condition on the ordinal reward responses, we fitted a cumulative link mixed-effects model using the ordinal package in R (R Core Team, 2024). The model included Verb Type (Basic vs. Superordinate) as a fixed effect and random intercepts for participant, item, and trial order. The model revealed a robust effect of Verb Type: superordinate verbs received significantly lower rewards than basic-level verbs ($\beta = -1.70, p < .001$).

Discussion Experiment 1 tested whether adults treat abstract, superordinate-level verbs as underinformative when labeling

single, clearly identifiable (and nameable) actions. The results were consistent with this prediction: although participants rarely judged the superordinate verbs to be outright incorrect, they rewarded them with significantly fewer large cupcakes than basic-level verbs, instead assigning more medium cupcakes. This pattern indicates that adults viewed the superordinate verbs as less informative descriptions of the depicted events, even though they were semantically compatible with the actions shown.

These findings support the view that “quasi basic-level” pragmatic expectations of informativeness extend to the verbal domain. Just as speakers are expected to provide sufficiently specific labels for familiar objects, they also appear to expect event descriptions to include an appropriate level of detail. Because abstract verbs remove manner (compare *move* and *run*) or other event-specific features, listeners judged them as less acceptable for identifying a single action in the absence of contextual motivation.

Experiment 2

In Experiment 1, adults judged superordinate-level verbs to be less appropriate than basic-level verbs for identifying single, familiar actions. We argued that this penalty arose because, in an isolated context, the superordinate verb stands in direct contrast to a more informative basic-level alternative: even though a description such as “A woman is moving” is literally true of a running event, it fails to provide the level of detail a reasonable addressee would expect for pinpointing the intended action. This account predicts that the penalty on superordinate verbs should diminish in contexts where the abstract label becomes sufficiently informative relative to the available alternatives. Experiment 2 was designed to test this prediction by introducing minimal contextual variation to the setup of Experiment 1 that either preserved or eliminated the informativeness of the superordinate verb (see also Choe & Papafragou, 2025, for similar reasoning in the case of nouns).

Participants Forty English-speaking adults were recruited from the same demographic groups as in Experiment 1.

Procedure The procedure and materials for Experiment 2 were similar to those used in Experiment 1, except for the changes noted below. In this experiment, participants played a “Find the different one” game with Mr. Lion, who again appeared on the screen as the speaker. At the beginning of each trial, four action images arranged in a 2-by-2 grid appeared next to Mr. Lion (Figure 3). One of these images was always taken from the critical trials of Experiment 1 and served as the target action; the remaining three images were drawn from the same or a different superordinate action category, depending on the condition. The position of the target image within the grid was randomized on each trial.

Participants were told that one of the four images was different from the rest. When the grid appeared, a red frame

highlighted the target image, accompanied by the prompt, “Hey, Mr. Lion, this one is different! What is it about?” Mr. Lion then produced a description for the target action using the same pre-recorded audio used in Experiment 1. As before, the description included either a basic-level (e.g., “A woman is running”) or a superordinate verb (e.g., “A woman is moving”).

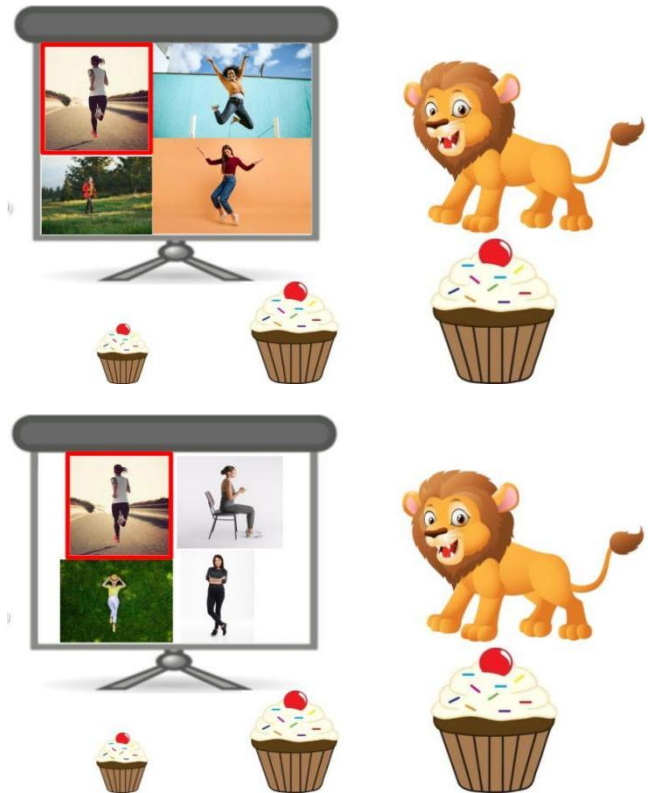


Figure 3: The display in the Same-superordinate (Top) and Different-superordinate (Bottom) versions of a critical trial in Experiment 2. The running scene was the target in this trial across both conditions and was described as either “A woman is running” (basic-level verb) or “A woman is moving” (superordinate verb).

Experiment 2 implemented a two-by-two design. First, Verb Type (Basic vs. Superordinate) was manipulated within participants: Mr. Lion provided both types of labels across the course of the experiment for each participant (but not for the same scene). Second, the composition of the non-target Alternatives in the grid was also manipulated within participants. In the Same-superordinate condition, all four actions, including the target (e.g., running, jumping, skipping, dancing) belonged to the same broad action category and could plausibly be described by the same superordinate verb (e.g., *moving*). In the Different-superordinate condition, the target action (running) depicted an action from a different superordinate category (*moving*) compared to the remaining three images (sitting, standing, lying; all examples of *being still*, see Figure 3). Following Mr. Lion’s utterance, the cupcakes appeared at the bottom

of the screen, and participants indicated whether Mr. Lion’s description deserved a small, medium, or large reward according to the same instructions used in Experiment 1. Because the experimenter had identified the target as “different,” participants were essentially asked to decide how appropriate Mr. Lion’s description was as a unique label for the highlighted action in that context.

In the Same- vs. Different-superordinate condition, the superordinate category applying to the non-target visual alternatives was: *move vs. be still, play sports vs. make food or drinks, work vs. play, decorate vs. do sports, play vs. do chores, exercise vs. communicate, travel vs. study, and perform vs. eat.*

Participants completed eight critical trials and twelve fillers. Fillers also used the 2-by-2 grid structure and included clearly true (n=6) and clearly false (n=6) statements about the name of a cartoon character in the target regardless of the characters in the rest of the grid (e.g., “This is Mario!”; same as in Exp.1). All participants saw the same set of filler trials, counterbalanced across four item lists to rotate Verb type and Category of Alternative for the critical trials.

Results Figure 4 shows the distribution of cupcake rewards for the critical trials in Experiment 2, separately for the Same-Superordinate and Different-Superordinate conditions.

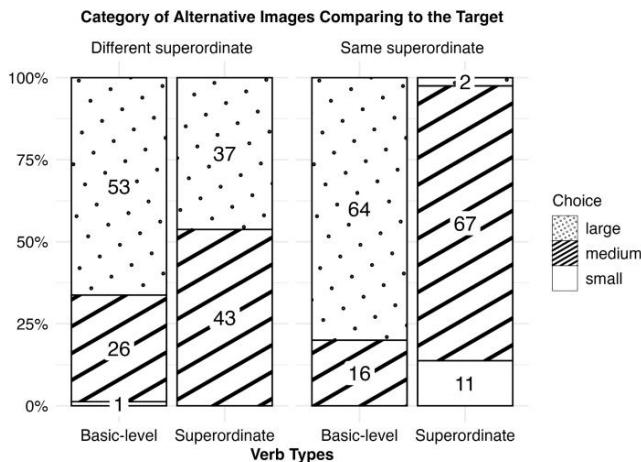


Figure 4: Experiment 2: distribution of rewards in critical trials. (Raw numbers of responses are noted within bars.)

We fit a combined cumulative-link mixed-effects model for Experiment 2 using the ordinal package in R. The model included Verb Type (Basic vs. Superordinate), Category of Alternatives (Different- vs. Same-superordinate), and the interaction between these two factors as fixed effects, along with random intercepts for participant, item, and trial order.

Table 1 reports fixed-effects estimates from the cumulative-link mixed-effects model. The model revealed a significant main effect of Verb Type: superordinate verbs were given smaller rewards than basic-level verbs. There

was also a significant main effect of Category of Alternatives. In addition, there was a significant interaction between Verb Type and Category of Alternatives. To explore the interaction, pairwise comparisons were conducted based on estimated marginal means, with p -values adjusted for multiple comparisons.

Table 1: Fixed-effects estimates from the cumulative link mixed-effects model for Experiment 2.

Predictor	β	SE	z	p
Verb Type	-0.89	0.35	-2.53	0.01*
Category of Alternatives	0.79	0.38	2.04	0.04*
Interaction	-4.33	0.75	-5.74	<.0001***

As expected, superordinate verbs and basic-level verbs presented flipped patterns for each category of Alternatives. Post-hoc pairwise comparisons show that superordinate verbs were more tolerated when the alternatives came from a different than the same superordinate ($\beta = 3.54, p < .001$). For example, when the target image depicted a woman running, participants were more willing to accept descriptions such as “a woman is moving” when the alternatives involved people staying still (Figure 3 – bottom panel) compared to cases where the alternatives depicted people moving in different manners, such as walking, sprinting, etc. (Figure 3 – top panel). In contrast, basic-level verbs were penalized when used alongside alternatives from different compared to the same superordinate ($\beta = -0.79, p < .05$). For example, when the target image depicted a woman running, participants were more willing to accept descriptions such as “a woman is running” when the alternatives all depicted people moving in different manners compared to cases where the alternatives came from a different superordinate.

Discussion The results of Experiment 2 demonstrate that the “basic-level bias” in verbs is highly flexible. While superordinate verbs were treated as pragmatically “wrong” (often receiving the minimum reward) when they failed to distinguish the target from similar alternatives, they became significantly more acceptable when they provided enough information to resolve the contrast.

Interestingly, we also observed a “matching” penalty: basic-level labels were rated slightly lower when used in contexts where a broader superordinate would have sufficed. This suggests that verb selection is a delicate balancing act: participants penalized both underinformativeness (in superordinates) and potential over-informativeness (in basic-level verbs). These findings indicate that adults do not simply default to a fixed basic level; instead, they dynamically evaluate whether a verb’s specificity matches the requirements of the immediate communicative context.

General Discussion

The present study investigated whether the well-attested basic-level bias in the nominal domain extends to the verbal

domain and, crucially, the extent to which pragmatic pressures for informativeness modulate this bias. In Experiment 1, we found that, in neutral contexts, speakers exhibit a robust preference for basic-level verbs over superordinate alternatives, mirroring the taxonomic advantages found in object naming (Rosch et al., 1976). However, the results of Experiment 2 demonstrate that this preference is not an absolute constraint. When the conversational context rendered a broad description sufficiently informative, the “penalty” for using a superordinate label was significantly attenuated. These findings suggest that the basic-level advantage in verbs is not merely a reflection of stable conceptual hierarchies, but is dynamically sensitive to the pragmatic requirement of being “informative enough” for the communicative goal at hand.

These results contribute to a growing body of work suggesting that linguistic taxonomies are evaluated relative to scales of informativeness (Horn, 1972). While previous research on action categorization has suggested that basic-level actions occupy a privileged cognitive position (Zhuang & Lingnau, 2022, 2023), our pragmatic account highlights the dynamic evaluation of linguistic expressions during conversational exchanges. Regardless of whether a specific verb level is cognitively preferred, its communicative value fluctuates based on the contrast set provided by the environment. This is particularly relevant for the verbal domain, where hierarchies are often less rigid and there is more polysemy compared to nouns (Levin, 1993). Our finding that the basic-level bias narrows in the Different-superordinate context suggests that listeners do not simply check for the most “salient” label; instead, they engage in a Gricean evaluation of whether the speaker has provided a level of detail that is sufficient to resolve the current ambiguity without being unnecessarily specific.

The present study opens several avenues for future research. One immediate implication concerns the notion of basic level as it applies to verbs. Our findings are consistent with the idea that, unlike nominal categories, relations between basic-level verbs and their superordinate counterparts are often graded and context-dependent, suggesting that basic-level status in the verbal domain may be less a fixed categorical property than a matter of inference. This raises the broader question of how reliably speakers can project meaning across levels of abstraction in verb hierarchies, and whether such inferences systematically shape pragmatic evaluation. Future work can address this question by independently characterizing inferential relations between verb categories, such as entailment strength or conceptual overlap, and examining how these measures relate to speakers’ judgments of informativeness.

A second direction follows from the observation that verb meanings can participate in multiple, partially overlapping abstraction structures. Our results invite closer examination of how a single action can be construed under different higher-level descriptions depending on intention, perspective, or discourse goals: for example, an instance of

biking may be described as exercising, competing, teaching, or entertaining in different contexts. Conversely, a verb that functions as basic-level in one setting may serve as a superordinate in another. In our experiments, *teach* operates as a basic-level verb. Yet it can plausibly function as a superordinate when considering coaches across different sports, whose actions may involve biking, swimming, or punching to teach. Together, these patterns underscore the fluidity of verb taxonomies and suggest that abstraction in the verbal domain is best understood as a dynamic mapping between verbs and event construals rather than a fixed hierarchical structure.

Furthermore, the present findings motivate extensions of this work across different languages, since languages differ widely in how they lexicalize events, including the extent to which components such as manner, path, or result are encoded in verbal roots (Papafragou et al., 2006). These structural differences shape the set of alternatives that speakers consider salient and informative in a given discourse. Consequently, cross-linguistic variation offers a natural testing ground for exploring how universal conceptual biases and language-specific lexical resources work together to determine what counts as a “sufficiently informative” verb in any given context.

Finally, developmental investigations are essential for understanding how children master the complex mapping between verbal labels and the events they describe. Verbs present a uniquely difficult learning task because they function as multidimensional bundles of meaning. To use a verb appropriately, a child must learn how these distinct semantic dimensions intersect with the specific requirements of a communicative context. Investigating at what point children select a verb, or a specific semantic dimension, that precisely fits the current interaction offers a critical window into the growth of human communicative competence.

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References

- Callanan, M. A. (1989). Development of object categories and inclusion relations: Preschoolers’ hypotheses about word meanings. *Developmental Psychology*, 25(2), 207–216. <https://doi.org/10.1037/0012-1649.25.2.207>
- Choe, J., & Papafragou, A. (2023). The acquisition of subordinate nouns as pragmatic inference. *Journal of Memory and Language*, 132, 104432. <https://doi.org/10.1016/j.jml.2023.104432>

- Choe, J., & Papafragou, A. (2025). Children's sensitivity to informativeness in naming: basic-level vs. superordinate nouns. HSP presentation.
- Connolly, A. C., Guntupalli, J. S., Gors, J., Hanke, M., Halchenko, Y. O., Wu, Y.-C., Abdi, H., & Haxby, J. V. (2012). The Representation of Biological Classes in the Human Brain. *Journal of Neuroscience*, *32*(8), 2608–2618. <https://doi.org/10.1523/JNEUROSCI.5547-11.2012>
- Do, M. L., Papafragou, A., & Trueswell, J. (2020). Cognitive and pragmatic factors in language production: Evidence from source-goal motion events. *Cognition*, *205*, 104447. <https://doi.org/10.1016/j.cognition.2020.104447>
- Grice, H. P. (1975). Logic and conversation. In P. Cole & J. L. Morgan (Eds.), *Syntax and semantics: Speech acts* (Vol. 3, pp. 41–58). Academic Press.
- Horn, L. R. (1972). *On the semantic properties of logical operators in English*. University of California, Los Angeles.
- Jordan, M. C., Greene, M. R., Beck, D. M., & Fei-Fei, L. (2015). A basic-level category structure emerges gradually across the human ventral visual cortex. *Journal of Cognitive Neuroscience*, *27*(7), 1427–1446. https://doi.org/10.1162/jocn_a_00790
- Jolicoeur, P., Gluck, M. A., & Kosslyn, S. M. (1984). Pictures and names: Making the connection. *Cognitive Psychology*, *16*(2), 243–275. [https://doi.org/10.1016/0010-0285\(84\)90009-4](https://doi.org/10.1016/0010-0285(84)90009-4)
- Katsos, N., & Bishop, D. V. M. (2011). Pragmatic tolerance: Implications for the acquisition of informativeness and implicature. *Cognition*, *120*(1), 67–81. <https://doi.org/10.1016/j.cognition.2011.02.015>
- Levin, B. (1993). *English Verb Classes and Alternations: A Preliminary Investigation*. University of Chicago Press. <https://press.uchicago.edu/ucp/books/book/chicago/E/bo3684144.html>
- Lewis, M. L., & Frank, M. C. (2018). Still Suspicious: The Suspicious-Coincidence Effect Revisited. *Psychological Science*, *29*(12), 2039–2047. <https://doi.org/10.1177/0956797618794931>
- Murphy, G. L. (2002). *The Big Book of Concepts*. The MIT Press. <https://doi.org/10.7551/mitpress/1602.001.0001>
- Papafragou, A., Massey, C., & Gleitman, L. (2006). When English proposes what Greek presupposes: The cross-linguistic encoding of motion events. *Cognition*, *98*(3), B75–B87. <https://doi.org/10.1016/j.cognition.2005.05.005>
- R Core Team. (2024). R: A language and environment for statistical computing. R Foundation for Statistical Computing. <https://www.R-project.org/>
- Rosch, E. H. (1973). Natural categories. *Cognitive Psychology*, *4*(3), 328–350. [https://doi.org/10.1016/0010-0285\(73\)90017-0](https://doi.org/10.1016/0010-0285(73)90017-0)
- Rosch, E., Mervis, C. B., Gray, W. D., Johnson, D. M., & Boyes-Braem, P. (1976). Basic objects in natural categories. *Cognitive Psychology*, *8*(3), 382–439. [https://doi.org/10.1016/0010-0285\(76\)90013-X](https://doi.org/10.1016/0010-0285(76)90013-X)
- Tanaka, J. W., & Taylor, M. (1991). Object categories and expertise: Is the basic level in the eye of the beholder? *Cognitive Psychology*, *23*(3), 457–482. [https://doi.org/10.1016/0010-0285\(91\)90016-H](https://doi.org/10.1016/0010-0285(91)90016-H)
- Wang, F. H., & Trueswell, J. (2022). Being suspicious of suspicious coincidences: The case of learning subordinate word meanings. *Cognition*, *224*, 105028. <https://doi.org/10.1016/j.cognition.2022.105028>
- Wang, F., & Trueswell, J. C. (2019). Spotting Dalmatians: Children's ability to discover subordinate-level word meanings cross-situationally. *Cognitive Psychology*, *114*, 101226. <https://doi.org/10.1016/j.cogpsych.2019.101226>
- Xu, F., & Tenenbaum, J. B. (2007). Word learning as Bayesian inference. *Psychological Review*, *114*(2), 245–272. <https://doi.org/10.1037/0033-295x.114.2.245>
- Zhuang, T., Kabulska, Z., & Lingnau, A. (2023). The Representation of Observed Actions at the Subordinate, Basic, and Superordinate Level. *The Journal of Neuroscience*, *43*(48), 8219–8230. <https://doi.org/10.1523/JNEUROSCI.0700-22.2023>
- Zhuang, T., & Lingnau, A. (2022). The characterization of actions at the superordinate, basic, and subordinate levels. *Psychological Research*, *86*(6), 1871–1891. <https://doi.org/10.1007/s00426-021-01624-0>