Syntactic bootstrapping with clausal complements of adjectives

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Like verbs, adjectives pose a challenge to the young word learner in that some—like *red, round, rough,* or *rectangular*—map onto properties that are detectable through the senses, while others—like *ready, reasonable, or required*—express abstract properties that have no reliable, physical correlate. Even for those adjectives whose properties are observable, how does a child know that one particular property is being highlighted above all others? The physical environment alone will not suffice. Just as with verbs, the child learning adjectives is faced with an inherent indeterminacy of meaning, which can only be resolved through the incorporation of cues originating from multiple sources.

With both grammatical categories, syntax plays a supporting role. A child who identifies the syntactic correlates in the language that they are learning can then partition the space of surface-level distribution into distinct 'clusters', mapping these groups onto a stable semantic meaning. For verbs, the syntactic environment is informative in no small part, because the elements occupying argument slots in the syntax are strongly correlated with particular semantic and thematic roles. However rough this mapping is, it still allows for children to 'break into' the system, associating notions of subject and object with the agent and patient roles of the event participants, as in (1). Thus, children can group together those verbs that are intransitive, and those that are transitive. But beyond this, further information is needed to zero in on a verb's meaning. How else will the child decide that *gorp* means 'sleep', 'laugh', or 'study' in (1a), or 'push', 'congratulate', or 'admire' in (1b)?

(1) a. Mabel {is gorping/gorped}.
b. Mabel {is gorping/gorped} Amelia.

For abstract mental state ('attitude') verbs like *want*, *hope*, *believe*, *think*, or *know*, sentential complements that are non-finite (2a) or finite (2b) perform a similar function, situating the subject relative to a proposition *p*.

(2) a. Mabel gorps (Amelia) to pilk (that).
b. Mabel gorps that Amelia will pilk (that).

While the syntactic environment serves to narrow the hypothesis space of meaning, it is not enough. Hacquard argues that the child must complement syntactic bootstrapping with pragmatic reasoning about the speaker's involvement in and contribution to the conversation, and their intentions, and with semantic information from the word's immediate linguistic context, thereby triangulating word meaning. A child might probabilistically associate declarative syntax (an embedded finite complement) with a commitment to the truth of the proposition, and nonfinite clause complements with a desire or preference. As evidence, Hacquard points out that children seem to posit indirect assertions with complements embedded under *think*, and experimental evidence reported by Harrigan, Hacquard, & Lidz (2019) demonstrates that the form of the clausal complement under *hope* (*hopes that* v. *hopes to*) influences children's interpretation of the embedding verb.

This process is, however, not unique to verbs: many adjectives also take clausal complements. By highlighting this commonality across grammatical categories and extending the bootstrapping story to adjectives, we uncover a much more complicated picture of word learning than one centered around verbs. In both cases, syntactic information alone is not sufficient to arrive at an intended meaning, but pragmatics and semantics take on a slightly

different role.

If a child is tracking finite and nonfinite clausal complements in the input to create clusters of syntactic structures, and associating with them a belief or truth commitment, or desire or preference, respectively, then presumably the same assumptions will carry over to adjectives. Indeed, emotive-factive predicates with adjectives (e.g., *be happy*), such as those in (3), much like their emotive factive verbal counterparts (e.g., *regret*), presuppose the truth of their finite complement (Karttunen, 1977). Even those with future tense in the embedded clause, as in (4), which suspend the presupposition of truth of the complement, express the embedded subject's commitment to the likelihood of a future-oriented event.

(3) a. I'm **afraid** we don't have any macaroni .[1,2]
b. I was **amazed** that you sat still all that time .[3]
c. I'm **glad** you don't have any cavities yet .[4]
d. It was **nice** that you slept for so long this morning after you came .[5]
e. Are you **sad** that it's broken ?[4]
f. Her Mom was **upset** that she dialed the north pole ?[3]

(4) a. They're **afraid** that the tiger will bite them (.) I bet .[4]
b. I'm **afraid** we'll make too much of a mess if we take it all out .[4]
c. I'm **afraid** you're going to break the plate .[2]

Interestingly, these same predicates also take nonfinite complements, as in (5), much like *hope*, and unlike *think* and *know*. While it is not readily apparent that the infinitival clause signals desire or preference, as it does with *want* or *hope*, each of the sentences in (5) could be paraphrased as the speaker or embedded subject wanting or not wanting an event to occur, as each signals a perspective relative to a possible state or event.

(5) a. You sure he's not **afraid** to ride the motorcycle ?[6]
b. I'm a little **afraid** to have my hair washed .[3]
c. Kimmy was **glad** to see you this morning .[5]
d. She's **happy** to have some company .[3]
e. It's not **nice** to tell jokes to yourself in company .[1]
f. I was thinking it would be **nice** to have a baby .[5]

This group differs from those adjectives that take a nonfinite complement, but not a finite complement, such as those in (6), each of which can be paraphrased with modal expressions of different flavors (e.g., *able, easy, ready*: *can*; *hard*: *cannot*; *dangerous*: *must not*).

(6) a. If you pull it away I won't be **able** to (.) take any more blocks out and I won't be **able** to make any more towers .[6]
b. I don't think we're going to be **able** to fix that bag now .[5]
c. He's **easier** to take care of that way . [1]
d. We better put them away because it's **dangerous** to leave medicine around .[4]
e. It's pretty **easy** to stand the cow up .[6]
f. This is a ball and it's **fun** to play with a ball .[5]
g. I'm sure that's not **hard** to do at all (.) dear .[1]

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[1] All examples, except for those in (7), are adult-produced child-directed speech cited from corpora in the CHILDES database (MacWhinney, 2000), with specific corpora indicated in subsequent footnotes.
[2] Corpus: Brown (1973) (Adam)
[3] Corpus: Braunwald (1971) ('L')
[4] Corpus: Suppes (1974) (Nina)
[5] Corpus: Sachs (1983) (Naomi)
[6] Corpus: Bloom: Bloom, Lightbown, & Hood (1975) (Peter)

h. It's very **hard** for you to talk into the microphone when you're drinking (.) Nomi .[5]
i. So when the fire alarm rings it will be **ready** to go to the fire .[1]

That the infinitival clause signals participation in a state or event can be highlighted by alternating an expletive subject with a gerundive subject with the adjective in predicative position, as in (7), or by placing the original object in subject position, as in (8), and introducing an agent expressed in an optional standard phrase (*for x)*.

(7) a. Standing up the cow is **easy** (for me) .
b. Playing with a ball is **fun** (for us) .
c. Doing that is **hard** (for me) .

(8) a. The cow is **easy** (for me) to stand up .
b. A ball is **fun** (for us) to play with .
c. This decision is **hard** (for me) to make .

Standard phrases like these and those in (9), highlight the fact that these 'relative gradable adjectives' encode a contextually-determined standard of comparison in their semantic representations, allowing for an evaluation of whether or not a property holds if it meets or exceeds that standard.

(9) a. He was **old** for a hamster xxx .[3]
b. It's a little bit **small** for me (.) isn't it ?[4]
c. It's good and it's **good** for you .[3]
d. Mashed potatoes are **good** for her tummy .[4]

When they do appear, they can combine with pre-adjectival adverbials like *too*, which indicates exceeding the standard, as in (10).

(10) a. But that bottle is too **big** for the freezer (.) isn't it ?[4]
b. Is his arm too **big** for this nightgown ?[4]
c. You are too **heavy** for me , kiddo .[3]
d. These pants are just a bit too **long** for you .[4]

What's more, even adjectives that do not select for a clausal complement such as *big* can appear in a sort of long-distance dependency with *too* or *enough* and an infinitival clause, as in (11), or *so* with a finite clause, as in (12). As with the verbs Hacquard discusses, with adjectives, too, these syntactic frames are informative, but only to the extent that the surface-level pattern is paired with extralinguistic, conceptual information linking back to the semantics. What's more, these clauses are not syntactic arguments or complements in the strict sense and are entirely optional, much like argument drop with verbs. One must appeal to extralinguistic information!

(11) a. I think the seals are probably too **big** to slide on slides .[4]
b. The moon is shining but it's too **bright** to see the stars .[5]
c. No (.) it was too **cold** these days to swim in the water .[4]
d. I think that one's too **large** to go in the window .[1]
e. Is she too **little** to hold the cup ?[4]
f. I think it's too **little** to be a Robin Redbreast .[3]
g. It's not good for a girl who's **old** enough to go to school to drink a bottle .[3]
h. It's too **heavy** for you to pour (.) honey .[5]

(12) a. Your tummy is getting so **big** you can't pick up the mushrooms ?[5]
b. It was so **cold** (.) that we hadta have our picnic inside the truck .[4]
c. Your mouth's so **full** we can hardly understand you .[3]

Across all of these cases, structural regularities are not sufficient to precisify adjectival meaning. Standards shift based on the context and speaker perspective. Some adjectives, like

emotion terms (e.g., *happy*, *afraid*) resist an expletive subject and must take an animate subject. Unidimensional adjectives such as *wide*, *tall*, and *long* may have the exact same distributional signature in the syntax, and the only means of differentiating may be the external physical correlates. Only gradable adjectives can be modified by adverbial intensifiers such as *very* or *really*. Thus, syntactic information alone is uninformative for carving out the adjectival space: as with verbs, it must be packaged together with conceptual, contextual, semantic, and pragmatic sources of meaning. Turning our attention to the acquisition of adjectives highlights just how nuanced and challenging syntactic bootstrapping can be, and how important it is that the child approach this challenge pragmatically.

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