The acquisition of event nominals and light verb constructions

Abstract

In language acquisition, children assume that syntax and semantics reliably map onto each other, and they use these mappings to guide their inferences about novel word meanings: For instance, at the lexical level, nouns should name objects and verbs name events, and at the clausal level, syntactic arguments should match semantic roles. This review focuses on two cases where canonical mappings are broken—first, nouns that name event concepts (e.g., "a nap"); and second, light verb constructions that do not neatly map syntactic arguments onto semantic roles (e.g., "give a kiss"). We discuss the challenges involved in their acquisition, review evidence that suggests a close connection between them, and highlight outstanding questions.

Keywords: syntax-semantics interface, word learning, event nominals, light verb constructions, argument structure

Human languages present reliable mappings between syntax and semantics. At the lexical level, certain syntactic categories often correspond to certain semantic categories—for example, nouns name objects, verbs events (e.g., Grimshaw, 1981; Pinker, 1984, 1989). At the clausal level, syntactic arguments match with semantic roles—for example, "the cat is chasing the mouse" names an event with two participants, with the cat as agent and the mouse as patient (e.g., Gleitman, 1990; Landau & Gleitman, 1985). These mappings have been shown to be an important assumption children entertain in early lexical acquisition. But there are exceptions. For example, at the lexical level, some nouns called *"event nominals"* (e.g., "a nap", "a party") denote events, rather than objects; at the clausal level, some sentences have more syntactic arguments than semantic roles, like *"light verb constructions"* (e.g., "Ann gave a kiss to Joe."). How do child learners fare with these cases? This paper offers a review of the acquisition of event nominals and light verb constructions, in the context of syntax-semantics mappings. We discuss existing evidence, highlight outstanding puzzles and questions, and raise a proposal, in the hope that this review will lay down some directions for future work regarding this topic.

In Section I, we briefly review the mounting evidence for children's reliance on the syntax-semantics mappings. In Section II, we discuss the acquisition challenge of event nominals, and review recent evidence that shows light verb constructions are important cues mitigating this challenge. Light verb constructions, however, by themselves present salient challenges; we discuss this in Section III, at the end of which we will see a chicken-and-egg problem. In Section IV, we propose a possible solution to the problem and discuss future directions.

I.   Children rely on syntax-semantics mappings in early word learning

To learn a word, the child must map its form to its meaning. But in principle, for any given word form, there are infinitely many possible meanings (Chomsky, 1981; Quine, 1960). The mappings between syntax and semantics, as widely seen within and across languages, have been posited as a foundation to guide the learner's inference about novel word meanings.

At the lexical level, there is a strong correlation between syntactic categories like "noun" and "verb" and semantic categories like "object" and "event" (e.g., Brown, 1957; Grimshaw, 1981; Pinker, 1984, 1989). Upon categorizing a novel word as belonging to the syntactic category "noun", for example, the learner's hypothesis space of possible word meanings can be reduced down to objects and entities, saving the effort to consider event concepts. In past decades, many studies have demonstrated that young learners are indeed able to use such mappings to infer novel word meanings—for a novel noun, they hypothesize an object/entity meaning (e.g., Echols & Marti, 2004; Fennell, 2006; Prudent, Hirsh-Pasek, Golinkoff, & Hennon, 2006; Trehub & Shenfield, 2007; Waxman & Booth, 2001); and for a novel verb, they hypothesize an event/state meaning (e.g., Bernal, Lidz, Millotte, & Christophe, 2007; de Carvalho, Dautriche, Lin, & Christophe, 2017; Echols & Marti, 2004; He & Lidz, 2017; Kobayashi, Mugitani, & Amano, 2006; Oshima-Takane, Ariyama, Kobayashi, Katerelos, & Poulin-Dubois, 2011; Oshima-Takane, Satin, & Tint, 2008; Waxman, Lidz, Braun, & Lavin, 2009). To make such inferences, the child needs to recognize the syntactic category (e.g., noun, verb) of the novel word; or, in other words, to distinguish one category from another[1]. It has been suggested that child learners use distributional cues in the linguistic input to do so. For example, analyses of child-directed speech have identified frequent frames like "the__is" and "you__it" as good cues to the noun and verb categories,

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[1] The child does not need to know the category labels "noun" and "verb". They only need to be able to distinguish one category from another (Pinker, 1984).

respectively (Mintz, 2003).2 Young learners have also been shown to be sensitive to these cues (Santelmann & Jusczyk, 1998), and able to use these cues for novel word categorization (Bernal, Dehaene-Lambertz, Millotte, & Christophe, 2010; Hicks, 2006; Höhle, Weissenborn, Kiefer, Schulz, & Schmitz, 2004; Jusczyk & Aslin, 1995; Mintz, 2006; see Shi, 2014 for a review).

At the clausal level, semantic roles such as agents and patients tend to be realized as syntactic functions such as subjects and objects (e.g., Dowty, 1989, 1991; Grimshaw, 1981; Macnamara, 1982; Pinker, 1984, 1989); and verbs with *n* syntactic arguments tend to have *n* semantic roles taking part in the events (e.g., Fisher, 1996; Gleitman, 1990; Landau & Gleitman, 1985). Inferences about the meaning of a clause/predicate could be drawn based on these correlations, and plenty of evidence for child learners' ability to do so has accrued. For example, "Big Bird is tickling Cookie Monster" is taken to name an event where Big Bird is the agent and Cookie Monster is the patient, rather than an event with reversed roles (Hirsh-Pasek, Golinkoff, Fletcher, DeGaspe-Beaubien, & Cauley, 1985); and given a scene of a bunny sitting on the back of a monkey, the novel verb in the clause "the money is ziking the bunny" is interpreted as CARRYING, but that in "the bunny is zilking the monkey" is interpreted as RIDING, in absence of richer discourse context (Fisher, Hall, Rakowitz, & Gleitman, 1994). These data all suggest young learners use the syntactic position of a noun phrase to infer its semantic role. Learners also use the number of noun phrases to make inferences about the kind of event denoted by the clause. For example, "the mouse *dax*ed the bird" is taken to describe a two-role causative event, such as pushing, as opposed to a one-role event, such as jumping, or a three-role event, such as offering something to someone (Arunachalam & Waxman, 2010; Fisher et al., 1994; Naigles, 1990; Naigles

2 To utilize these frames, children do not need to have acquired the function morphemes; they just need to recognize them as frequently appearing units and use them as distributional cues.

& Kako, 1993; Yuan & Fisher, 2009; Yuan, Fisher, & Snedeker, 2012 inter alia). Importantly, children still rely on the mappings even when their language allows argument drop (Göksun, Küntay, & Naigles, 2008 on Turkish; Lee & Naigles, 2008 on Mandarin; Lidz, Gleitman, & Gleitman, 2003 on Kannada; Matsuo, Kita, Shinya, Wood, & Naigles, 2012 on Japanese), and even when their language offers more reliable cues than the number of syntactic arguments (e.g., in Kannada, morphological marking reliably cues causativity whereas transitivity does not; see Lidz et al., 2003). Children's bias to rely on the syntax-semantics mappings in language acquisition, even if it is not perfectly reliable, can be taken as indicative of how deeply ingrained this mechanism is in learners' brains.

Debate is still ongoing about *how* the mappings are manifested in the learner's mind. In some theories, they are built into the child's learning apparatus, together with the relevant category notions (e.g., noun/verb, object/event, subject/object, agent/patient). According to this theory, what the child learner needs to learn from the input is the surface realizations of those categories in the target language (Bloom, 1990; Borer & Wexler, 1987; Pinker, 1984; Valian, 1991; Wexler, 1998). Alternatively, the mappings may be induced by the learners based on patterns in the input, and the relevant categories are distributionally defined clusters (e.g., Ambridge, Pine, Rowland, Freudenthal, & Chang, 2014; Lieven, Behrens, Speares, & Tomasello, 2003; Tomasello, 2000, 2003). One direction researchers pursue to distinguish these possibilities is to see whether such mappings and relevant categories are utilized *early* in development, before the learner receives enough exemplars from the input as basis for induction (see He & Lidz, 2017, pp. 17–18, for a recent discussion). But it still remains unclear how early is early enough, and how many exemplars are sufficient. Thus far no conclusive evidence has yet appeared to resolve the debate. Regardless of their *origin*, though, it appears uncontroversial that reliable syntax-semantics mappings function

as a strong assumption, kick-starting the daunting task of word learning.

II.   The challenge of event nominals: Light verb constructions as a recue

The mappings discussed above only capture strong correlations between form and meaning, but are by no means deterministic or exclusive. For instance, the correspondence between subjects and agents only seems to hold in what Keenan (1976) calls "basic sentences" (e.g., active sentences are basic; passives are not). For another instance, instruments are critical participants in many events (e.g., knives in slicing events), yet are not reliably expressed as syntactic arguments (e.g., Rissman, Rawlins, & Landau, 2015; also see He, Wellwood, Lidz, & Williams, 2013; Wellwood, He, Lidz, & Williams, 2015 for discussion on event participant conceptualization). Since children heavily rely on syntax-semantics mappings in early word learning, as discussed in Section I, cases where the mappings are disrupted would presumably pose a challenge. The case of interest here is "event nominals".

Event nominals are words that have nominal syntax but semantically denote event rather than object concepts—for example, "an earthquake", "the destruction", "a nap", "the birthday party", etc.[3] Despite the mismatch, this category does appear in children's early productive vocabulary. In fact, the MacArthur-Bates Communicative Development Inventories—Words and Sentences (Fenson et al., 1993), a vocabulary inventory for children aged 16-30 months, includes several event nominals like "nap", "party", "game", or "bath". In a study of 45 children, Nelson, Hampson, & Shaw (1993) reported more than half of the children used event-denoting nouns by

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[3] In this paper, we broadly define *event* to generally denote things that happen over time, including states, facts, and situations, since nothing in this paper hinges on the exact definition of *event* (Casati & Varzi, 2008).

20 months of age.4 Similarly, in a study of 9 English-learning 1- and 2-year-olds' productions, Barner (2001) found that, although the majority of children' words respected the canonical mappings (that is, object-denoting words used in noun syntax and event-denoting words in verb syntax), children also demonstrated flexibility, producing some object-denoting verbs and event-denoting nouns.

But production does not entail adult-like representation; in other words, the fact that children have event nominals in their productive vocabulary does not necessarily entail that they know what these words mean, like adults do. In fact, a recent study with 2- to 3-year-olds demonstrates that children's event nominals are closely associated with the objects involved in the event (Arunachalam & He, 2018). Children were asked to match an event nominal like "nap" to a picture. When the selection was between a picture of sleeping-in-a-bed (i.e., sleeping event happening with a canonically associated object, a bed) and a picture of a bed alone (i.e., no occurrence of sleeping), children were significantly above chance, with a clear preference of the event over the object; however, they were at chance when the selection was between a picture of sleeping (not in a bed) and a picture of a bed alone. This suggests that at an age when children already produce some event nominals, their representations are not completely adult-like, in that they incorrectly require canonical objects to be involved. Nevertheless, by this age, they do seem to know that words like "nap" are eventive.

How do children come to learn that certain nouns have eventive denotations, especially provided that they rely on the canonical mappings such as noun–object and verb–event (see Section I; e.g., Waxman et al., 2009, for nouns; He & Lidz, 2017, for verbs)? One possibility is

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4 We use the word *event* to refer to both actions and non-action events (see footnote 3). In Nelson et al. (1993), some children produced nouns that denote actions, some produced nouns that denote non-action events.

that they first learn the verbal form of the word (e.g., napped), knowing that this word has eventive meaning, and then "transfer" this meaning to its nominal form (e.g., a nap). While this may well be the case for some event nominals, many early-acquired event nominals rarely occur in the verb form in the language input to young children. For example, a preliminary corpus analysis of 30 CHILDES corpora of children ages 5 and under (He & Arunachalam, under review) (He & Arunachalam, under review) reveals that "nap" occurs in its verb form only 9 out of 498 times, and "party" 2 out of 484.

Another possibility is that children know verbs appear with arguments, based on which they infer that nouns appearing with arguments (e.g., "the early planting of the seeds", "the destruction of the city") resemble verbs in that they both have an event denotation. But first, early acquired relational nouns (sister, father, cousin) also require arguments; and second, many early-acquired event nominals seldom appear with arguments (e.g., ?the nap of the baby, *a jump of the boy; Borer, 1999; Grimshaw, 1990; Moulton, 2014; Roy & Soare, 2013).

Although lacking extensive argument structure cues, there may still be other cues in the linguistic environment of simple event nominals that signal their distinctive semantic status, differing from regular object-denoting nouns. One such cue, as recent evidence suggests which we review below, is occurrence in light verb constructions.

Light verb constructions are complex verb phrases (VPs) in which the verb makes the bulk of the syntactic contribution, providing tense, number, agreement and aspect marking,[5] but semantically the verb is partially or fully devoid of its default meaning and thus seems to be "bleached" (Brugman, 2001; Butt, 2003, 2010; Jackendoff, 1974; Jespersen, 1954; Wiese, 2006)

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[5] But see Barner, Wagner, & Snedeker (2008) and Wittenberg & Levy (2017) for discussion how the verbal markers semantically interact with the syntax and semantics of the event nominal.

(though not completely empty; see e.g., Everaert & Hollebrandse, 1995). This semantically-light nature of light verbs has led some theories to consider them as functional elements such as auxiliaries (e.g., Cattell, 1984), or a middle category between auxiliary and main verb (e.g., "thin verbs", Allerton, 2002). Compare (1a) to (1b) below. The verb "give" in (1a) is a regular verb, describing a transfer event, which is the semantic core of the event. But in (1b), "give" seems to make little contribution to the meaning of the event, yet the noun phrase "a kiss" does a lot; in fact, the meaning of (1b) can be largely preserved in a paraphrase without the verb "give", such as (1c) (Wittenberg, Khan, & Snedeker, 2017; Wittenberg & Snedeker, 2014) (but see Wittenberg & Levy, 2017, for evidence of meaning differences between (1b) and (1c)). The verb in (1b), therefore, is a light verb, and constructions like (1b) are light verb constructions. Other examples of light verb constructions include "take a nap", "have a party", "do a jump", etc. The form-identical counterpart in (1a) is a non-light construction. Other examples include "take a gift", "have a pet", "make a knot", etc.[6]

(1) a. Alan gave Elsa a book.

b. Alan gave Elsa a kiss.

c. Alan kissed Elsa.

Recent evidence suggests that light verb constructions may be an important to cue to the eventive denotations of event nominals. In He & Arunachalam (under review)'s corpus analysis of CHILDES mentioned above, they find that event nominals occur with a small set of light verbs––e.g., "nap" mostly occurs with "take" and "have", whereas object-denoting nouns occur with a

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[6] Note that light verb constructions are hallmarked by the verb's little semantic contribution, and are not limited to a particular argument structure. In other words, a light verb construction could be transitive ("take a nap") or ditransitive ("give Elsa a kiss"). We therefore include a variety of examples here.

much more diverse set of verbs—e.g., "cake" occurs with "eat", "buy", "bring", "have", a subset of which have the same surface forms as light verbs but are not semantically light (as in "have some cake"). In other words, in the input available to child learners, object nouns occur in a wide range of verbal contexts, whereas eventive nouns occur always with a small set of verbs with vague, basic meanings. This distributional difference could be a first cue for the child to separate event nominals from regular object-denoting nouns.

Stronger and more direct evidence comes from a novel-word learning study (Arunachalam & He, 2018; He & Arunachalam, under review). Preschoolers (2- to 5-year-olds) first learned a novel noun from a dialog between two conversers—one group of them heard the word in light verb constructions (e.g., "I can do a gorp", "Annie likes doing gorps"), and the other group heard it in non-light syntax (e.g., "I like gorps", "I found a gorp."); both groups then saw a novel character performing a novel action, and heard the novel noun again (e.g., "Look, he's doing a gorp!" for the light-syntax group, and "Look, there's a gorp!" for the non-light group). Subsequently at test, the children saw two scenes on opposite sides of the screen, both depicting the familiar character—in one it performs a new action, and in the other it performs the now-familiar action—and were prompted to point to the novel noun's referent (e.g., "Can you point to a gorp?"). For children who heard the non-light syntax, they should infer that the novel noun labeled the now-familiar object, based on the canonical mapping between nouns and objects. For children who heard the light syntax, however, if they were able to use light verb constructions as a cue to override the canonical mapping, they should infer the novel noun labeled the novel action. The results were clear: Children who learned the novel noun in light verb constructions pointed to the familiar action (the target) 100% of the time, whereas children who learned it in non-light syntax pointed to each character randomly (58% point to the target). No age effect was found—

children at all ages (within the relatively wide age range) successfully utilized light verb constructions to infer an eventive denotation. But note that the only light verb used in this study was "do", which is special among all light verbs—Butt (2010) calls it a "verbalizer" rather than a typical light verb. We will return to this point later.

In sum, in this section, we see that event nominals present a case of mismatch between syntactic and semantic categories, posing a potential learning challenge; yet light verb constructions provide useful cues that a noun names an event, rather than an object, concept. But we are yet faced with another puzzle: how do children acquire light verb constructions to begin with?

III.   How children acquire light verb constructions: Challenges and proposed solutions

Children's success in acquiring event nominals via light verb constructions is impressive, but puzzling. After all, light verb constructions are a rather complex construction by themselves. In this section, we will discuss (i) light verb constructions in children's production, and (ii) challenges in recognizing light verb constructions (ii1 & ii2).

(i) Late production of light verb constructions

While the verbs used in light verb constructions themselves ("do", "give", "make", "take") are acquired early (Goldberg, 2013; Maouene, Laakso, & Smith, 2011), true light verb constructions appear late in children's spontaneous production (Barner, 2001). In Barner's (2001) study with 9 English-learning children (aged 1;3-4;6), early uses of the forms of some *potential* light verbs (i.e., verbs in identical forms with light verbs, but not necessarily light) were observed, at Brown's Stage

I, with a 1.0-2.0 MLU; but these early uses were hardly light verb constructions—only half took complements at all, among which the majority occurred with pronouns (e.g., "do it", "get that"). Frequent use of these verbs with content nouns as complements did not begin until Brown's Stage IV (MLU 3.0-4.0, roughly 40-46 months). Even when children use these verbs with content nouns as complements, a lot of their uses are the so-called general all-purpose verbs ("GAP" verbs)— which are used in place of verbs with specific meanings (e.g., use "make a house" instead of "build", "make a hole" instead of "drill")—to be distinguished from true light verbs (see a discussion of this distinction in detail in Kambanaros & Grohmann, 2015).

The late-emergence of true light verb construction use is perhaps due to the non-canonical mapping of this construction, and children may prefer to use a different way to express the same meaning. And in fact, children prefer to use non-light (e.g., "A kissed B") over light constructions (e.g., "A gave B a kiss") (e.g., Barner, 2001; Oshima-Takane, Barner, Elsabbagh, & Guerriero, 2001).

Similarly, in a count for this paper, we found that the same verb is used by children in non-light more often than in light verb constructions: A perfunctory analysis of the Brown corpus (MacWhinney, 2000) shows that of about 3,500 children's utterances of high-frequency verbs ("do", "make", "have", "give", "get") occurring with full NP objects (as opposed to pronouns), only 15.6% of these NPs denoted events and could thus conceivably be parts of light verb constructions, with little variance between verbs and children's ages (see Figure 1). This preference of children holds despite that in adult speech, verbs like "give" are used more in light than in non-light verb constructions (Piñango, Mack, & Jackendoff, 2006; Wittenberg, Paczynski, Wiese, & Kuperberg, 2014; Wittenberg & Piñango, 2011). Together, current evidence seems to suggest that light verb constructions appear late in children's production; in fact, some argue that

it is the complexity of light verb constructions that delays children's production of event nominals (Barner, 2001; Oshima-Takane et al., 2001).

---FIGURE 1 ABOUT HERE---

(ii) Recognition of light verb constructions: Challenges and proposals

Late production does not necessarily entail late comprehension, just as early production does not entail early adult-like comprehension (as in the case of event nominals). Children may still be able to *recognize* light verb constructions early on, and utilize them as a cue to event nominals, as shown in Arunachalam & He (2018). In fact, early recognition of light verb constructions is likely because light verbs are quite frequent in the input (De Villiers, 1985; Naigles & Hoff-Ginsberg, 1998; Theakston, Lieven, Pine, & Rowland, 2004), and they are semantically general— semantically general verbs have been theorized to have a privilege in acquisition by a number of researchers (Clark, 1978; Gerken, 1991; Goldberg, 1998; Ninio, 1999; Pinker, 1989). But there are challenges.

(ii-1) How to distinguish a light verb from its non-light counterpart

One salient challenge in the recognition of light verb constructions is that light verbs are often form-identical to a non-light verb of the language (at least when we exclude verbalizers such as "do" and modal-like light verbs; Butt & Lahiri, 2013); in other words, at least in Germanic languages, a light verb use and a non-light verb use are indistinguishable: See "give" in (1a) and (1b) above, "took" in (2a) and (2b), and "had" in (3a) and (3b) below. If the child learner uses light verb constructions as a cue to event nominals, and she mistakes a non-light verb for its light counterpart, she will wrongly infer, taking (2a) and (2b) as an example, "pillow" is event denoting (provided that she does not know the meaning of "pillow"); and similarly, if she mistakes a light

13

verb for its non-light counterpart, she will wrongly infer that "nap" is object denoting (provided that she does not know the meaning of "nap"). How, then, does the child learner distinguish a light verb construction from its non-light counterpart, when not all parts of the construction are in the child's lexicon yet?

(2) a. Al took a nap.

b. Al took a pillow.

(3) a. Jo had a walk.

b. Jo had a kitty.7

Here we propose a possible solution: Light and non-light verb constructions have different syntax-semantics mappings, which can be a cue to differentiate them. Specifically, syntactic arguments and semantic roles match in a one-to-one manner in non-light constructions, but not in light verb constructions. For example, both (1a) and (1b) have three syntactic arguments—"Alan", "Elsa", and "a book" / "a kiss". In (1a), each is mapped onto a semantic role in the event, a giver, a recipient, and a theme. But the event of (1b) only seems to have two semantic roles, a kisser, and a kissee, rendering the NP "a kiss" with no semantic role to map onto. Alternatively for (1b), one may argue that the event has two sets of semantic roles: One set projected by the light verb,

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7Cases with "have" are interesting because they provide an additional cue for the child, owing to their aspectual properties. For instance, the progressive is only possible for combinations with eventive or consumption nouns ("Jo is having a walk/*Jo is having a kitty", with the idiomatic "Jo is having a baby" being, as far as we can see, the only exception that does not involve a coercion to ingestion: "Jo is having a beer/burger/ice cream/soup" means she is consuming these objects, which would, sadly, be the only available interpretation for "Jo is having a kitty" as well.) Likewise, the simple present acquires a habitual/stative reading for the eventive noun: *"Jo has a walk" is odd; but "Jo has a kitty" is fine, since it is a state. In short, the distribution of grammatical aspect may clue kids in to when they are dealing with a light verb construction as well. Of course, other uses of "have" with abstract concepts denote states relating the subject to a property ("Jo has a kidney infection", "Jo has a fun attitude"). How do children acquire these? We hope someone will ask this question in greater detail than we can here.

including a giver, a recipient, and a theme, in which the NP "a kiss" is the theme of transfer; and the other set projected by the event nominal, including a kisser and a kissed; this is called "Argument Sharing" in some theories (Baker, 1989; Butt, 2010; Jackendoff, 1974, 2002; Müller, 2016; Ramchand, 2013). In either case, the syntax-semantics mapping is *not* straightforwardly homomorphic for light-verb constructions, but *is* so for their non-light counterparts. See Figure 2.

---FIGURE 2 ABOUT HERE---

Recent evidence suggest that adults do distinguish light from non-light constructions in terms of syntax-semantics mappings. In Wittenberg et al. (2017) and Wittenberg & Snedeker (2014), adults were trained to categorize sentences based on the number of semantic roles conveyed. They treated non-light transitive verbs (e.g, "Grandma Kennison grew marijuana plants") as belonging to one category (i.e. 2 roles/arguments) and sentences with non-light ditransitive verbs ("The millionaire sells his friend a yacht") as belonging to another category (i.e. 3 roles/arguments); yet sentences with light ditransitive verbs (e.g., "The teenage gave a kick to his rival") were treated as a category in between (i.e. 2 or 3). But whether children are able to do so remains unclear.

(ii-2) How to recognize a "potential" light form

There is yet another problem with the above proposal: Not all structures that demonstrate misalignment in argument-role mapping are light verb constructions, both within English and across languages. For example, control structures like in (4) present similar mapping problems to learners (Kirby, 2009; example from there), because the object of the matrix clause in these structures is, at the same time, the subject of the controlled clause:

(4) Suki asked/told Neil$_i$ [PRO$_i$ to kiss Louise]

Nevertheless, children comprehend structures like (4) above by age four, and they also produce them. A different story are subject-to-subject raising constructions like (5), whose acquisition has been argued to be delayed until age seven (Hirsch, 2011; example from there):

(5) Johni seems (to Mary) [ti to be dancing]

But even constructions that don't involve lexical items being assigned multiple thematic roles from different predicates – similar to light verb constructions, which assign thematic roles from the light verb, and the light noun – pose problems to learners. For instance, (6a) has two syntactic arguments, but a stealing event necessarily entails a thief, a loot, and a victim (without the victim, "steal" would equate "pick up"). For another example, (6b) has two syntactic arguments, but an additional instrument role seems to be entailed in a wiping event. One may argue that the instrument role is not a core event participant (Rissman et al., 2015), but in many languages (e.g., Mandarin, Igbo), the instrument is realized as a syntactic argument whereas the patient is not, as in (6c), when the patient role is almost the least controversial candidate for a core event participant (see Williams, 2008, 2015 for more discussion).

(6) a. Mo stole a purse.

b. Al wiped the table clean.

c. Ta ca   zang le   mabu.

He wipe dirty LE (aspect) rag

He wiped something with a rag, and as a result, the rag became dirty.

Therefore, while a syntax-semantics mismatch may be a useful cue to differentiate a light verb from its non-light counterpart, it is only helpful when the child knows that it is "potentially"

light (as opposed to a heavy verb with no light counterpart). How does the child know whether a verb is a "potential light verb" (see (7) for our definition) in the first place?

(7) *Potential light verb*: A verb that can appear in light verb constructions but sometimes does not. A potential light verb has a light verb usage and a form-identical non-light verb usage. Examples: "take" and "have" are potential light verbs, whereas "wipe" and "steal" are not.

One possibility lies in the semantics. Semantically heavier verbs often have more specific restrictions on what arguments they take, therefore selecting a narrower range of object nouns, whereas semantically lighter verbs may occur with a broader range of object nouns (e.g., Brown, 2008). For example, Brown (2008) has found that in Tzeltal, argument ellipsis usually happens with semantically heavier verbs, likely because these verbs select for specific objects, dropping which will not induce ambiguity (also see Resnik (1996) for evidence for correlation between verb selectivity and object ellipsis). Maouene, Laakso, & Smith (2011) also found that adult speakers came up with a narrower range of object nouns associated with semantically heavier verbs than with semantically lighter ones. This difference could be a cue for deciding whether a verb is a potential light verb.

However, two problems limit its potential. First, note that "semantically lighter" is a relative notion—while light verbs are indeed semantically lighter, semantically lighter verbs are not necessarily light verbs. For example, the verb "help" can be associated with a relatively wide range of objects, and thus make a semantically lighter verb according to the criteria above, compared to the verb "read" which typically selects for "book" (among others) (Maouene et al., 2011); but "help" is not a light verb. If the child learner uses how many semantically-associated

objects as a cue, she may miscategorize verbs like "help" as a potential light verb. In addition, exactly because this is a relative notion and semantically lighter and heavier verbs are distributed on a continuum, rather than in two discrete clusters (Maouene et al., 2011), there is no category of "light verbs" that the child learner can arrive at based on this cue. Second, and more importantly, although a distinction between semantically lighter and heavier verbs in terms of the range of objects associated is found in adult speakers, no such distinction is found in the language in children's environment; sampling from CHILDES data8 suggest that most verbs seem to all co-occur with a narrow set of nouns. For example, "push" is associated with a quite wide range of objects according to adult speakers, but in CHILDES, "push buttons" accounts for the majority of occurrences of "push" (Maouene et al., 2011). Thus, this cue may not be quite useful to children after all.

Here we propose another possibility: The child infers that a verb is a potential light verb, rather than a "heavy" verb, if she recognizes that the verb can take an eventive noun as its direct object argument. This proposal, however, seems to present a chicken-and-egg problem: On one hand, children learn a noun is eventive (rather than object-denoting) from light verb constructions (as discussed in Section II); but on the other hand, we propose that the recognition of light verb constructions rely on event nominals. There might be a breach to this circle.

IV. The circle of event nominal and light verb acquisition: "do" breaks the path

This breach to this problem may be "do"—a light verb free of the ambiguity other light verbs have.

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8 Although they used a combination of parental speech and the speech of the child her/himself; so, this is not precisely a reflection of the input to the child, but nevertheless does capture the language in the child's environment.

The verb "do" subcategorizes for an event (Bruening, 2019; Méry, 2002; Wamper, in prep), such as (8a) and (8b), and hence is almost always used in light verb constructions (rarely in non-light ones). Even when an object-denoting noun fills the direct argument of "do", some eventive meaning is usually coerced—for example, (8c) sounds very odd if used out of the blue, but may be coerced to mean some activity associated with "book", as in (8d). Given this clean distribution of VPs headed by "do", the child learner does not have the problem of determining whether it is the light or non-light. Therefore, "do" might be a path-breaking verb among all light verbs.

(8) a. Cal did a jump.

b. Cal did a rinse.

c. #Cal did a book.

d. To prepare for the presentation, we each produced some materials: Sue did a newspaper; Joe did an NPR interview; and Cal did a book.

Once the child acquires the verb "do", she may assume that the VP headed by "do" is a light verb construction. From there, she infers that the direct object argument of that VP is an event-denoting noun. Therefore, the child may use the "do"-constructions to learn a few event nominals, and then use those few learned event nominals to learn other light verbs. From there, she recognizes potential light verbs, and decide whether a potential light verb is used in its light form or non-light form based on argument-role mappings. See Figure 3 for a summary of these inferences.[9]

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[9]A caveat, however, is that eventive nouns can also be direct objects of non-light verbs, as in "imagine the kiss", "like the party", etc. Analyses of the language input on the frequency of such occurrences are called for.

---FIGURE 3 ABOUT HERE---

This proposal predicts that the child learner acquires the verb "do" before other light verbs. Evidence from Barner's (2001) study on production shows that among the five light verbs examined ("have", "give", "take", "do", and "get"), the use of "do" was most frequent at both an earlier (MLU 1.0-2.0) and a later stage (MLU 3.0-4.0) of examination. Our corpus analysis results, previously discussed in Section II (Figure 1), also show that in children's production "do" occur most frequently as a light verb than other frequent verbs. What is interesting is that children use "do" with some objects-denoting nouns ("we did the peas", "do boots"), which rarely occur in adult speech.[10] These appear to be coercions—that they simply use "do" as a verbalizer (Butt, 2010).[11] Future work should explore what drives them to use "do" in this way, despite lack of data in the input. The finding from He & Arunachalam (under review) that children are able to use "do" constructions (e.g., "I can do a gorp") to infer that a novel noun is event- rather than object-denoting, as discussed in Section II (p. 10), also suggests that "do" is understood early.

These data, however, only constitute indirect evidence. Future work on the acquisition timeline as well as the input of "do" is called for. Empirical evidence directly testing the prediction—that "do" is acquired earlier than other light verbs—needs to be gathered. Corpus analyses of the use of "do" in child-directed speech (as well as in adult speech) should be conducted to provide empirical support for the claim that "do" almost exclusively occur with nouns that denote events. For both the above endeavors, attention should be paid to two points. First,

[10] This finding is in line with a recent report that children (typically-developing as well as with SLI) have a tendency to use general all-purpose verbs ("GAP" verbs) to substitute verbs with specific meanings (e.g., use "make a house" instead of "build", "make a hole" instead of "drill") (Kambanaros & Grohmann, 2015).
[11] Included in the count are also objects that seem to be used as locations or goals, without prepositions (e.g., "what dat that do treasure chest"), creation usages ("you did the eyes and she did the nose"), and *do* as verb of imitation ("watch me do horsie").

auxiliary uses of "do" (e.g., "he didn't jump", "did she sleep?", "Bill swam and so did I") should be distinguished from its light verb uses. In fact, the auxiliary uses of "do" may be another door through which children come to recognize "do" is special; tracking and comparing auxiliary and light-verb uses of "do", therefore, will be useful. Second, idiomatic (or routine, non-analytic) uses should be noted (e.g., "do me a favor"). Idiomatic phrases may be treated as a whole "chunk" rather than learned analytically; but our point of learning event nominals from light verb constructions require analytic encoding of the phrases (e.g., a light verb, the direct argument of which is an event-denoting noun phrase). While idiomatic uses are common, their ratio relative to non-idiomatic uses may be small, but empirical evidence would be preferred to back up this point. Last but not least, another direction for future work that may shed light on our understanding of the apparent circle and a potential "pathbreaker" lies in cross-linguistic investigation: if there is a generic (i.e. unambiguously light) form of light verbs cross-linguistically, this may be part of the child learner's prior expectation, and the question boils down to finding the surface realization of the expected category.

To conclude, in this paper, we have discussed the challenge of event nominals in the context of syntax-semantics mappings—children assume nouns to name objects and use this assumption as basis to infer novel noun meanings; how do they, then, learn nouns that denote event concepts? Recent evidence suggests that light verb constructions might be an important cue. But light verb constructions themselves are not straightforwardly easy to learn: they are late appearing in production, and even their recognition presents challenges. The current literature does not yet have clear answers; in fact, the challenges per se have not received enough attention.

We propose that the acquisition of event nominals and that of light verb constructions are inter-related: Children acquire "do" first, as a member of the light verb category, and learn a few

event nominals from "do"-constructions; consequently, they may use those learned event nominals to learn other light verbs in their language, and use the newly-learned light verbs as footsteps to more event nominals. This proposal has an interesting implication to the big picture of syntax-semantics mappings: event nominals are a case of mismatch between form and meaning at the lexical level, light verb constructions are such a case at the clausal level, and they are cues to each other. What is apparently a mismatch is in some sense a match.

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Figure Legends

Figure 1. Eventive/light (green) and non-eventive/non-light (blue) syntactic objects used with verbs that can function as light verbs in the Brown corpus, broken down by verb (LEFT) and age of children (RIGHT).

Figure 2. Syntax-semantics mappings for non-light (a) and light (b) constructions

Figure 3. Inferences between event nominals and light verbs, with "do" to break the circle (N_i and N_k are specific event nominals, and V_a a specific verb)