Children's Interpretation of Phrasal versus Compound *-er* Nominals in English

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1 Introduction

We present new evidence that children learning English are overly liberal in their interpretation of deverbal nominals such as *sweeper of leaves*. Such phrasal *-er* nominals with an *of*-PP complement can only refer to Agents (e.g., the one doing the sweeping, cf. Levin & Rappaport, 1988; Rappaport Hovav & Levin, 1992; Van Hout & Roeper, 1998). We found that children, however, readily allow Instrument readings (e.g., the broom the leaves are swept with). Our findings are in line with previous studies on deverbal nouns (Randall, 1982; Johnson, Bateman, Moore, Roeper & De Villiers, 1996), but are not compatible with Clark and Hecht's (1982) proposal. Taken together these studies suggest that children are not yet sensitive to the syntax of argument structure mapping in derived nominals. Children's syntactic representations do not differentiate phrasal and compound *-er* nominals, whereas those of the adults are essentially different. Thus children's lexicon-syntax interface for derived nominals is not adult-like and they still need to learn subtle details of the syntax of argument structure when a verb is nominalized.

Van Hout and Roeper (1998) account for the exclusive Agent interpretation of phrasal *-er* nominals by positing an extended VP inside it. One of the heads in this extended VP introduces an Agent argument, which, as it must be bound by a referent, gets linked to *-er*, hence the obligatory Agent reading. Compound *-er* nominals on the other hand do not involve an extended VP, and may freely refer to Agents and Instruments. How do children interpret phrasal *-er* nominals with *of*-complements (*catcher of flies*) as compared to compound nominals with an incorporated complement (*fly catcher*)? In two experiments, one using a truth-value-judgment task and the other a picture-selection task, we tested 35 English learners (4;0-6;5) and 15 adults on their interpretation of phrasal *-er* nominals and *-er*-compounds, presenting them with pictures of Agent and Instrument referents. If subjects apply the syntactic argument structure consequences of *-er* nominals with *of*-complements, they should reject these for Instrument pictures, and accept them only for Agents, while at the same time accept both Agents and Instruments for *-er* compounds. This was indeed the pattern in the adults' results. The children, however, accepted both kinds of referents for both types of noun phrases, making no distinctions.

We argue that none of the children's *-er* nominals have an underlying extended VP structure. Instead both types of *-er* nominals have the same, simple nominal structure in which the verb incorporates into the *-er* noun and there are no restrictions on argument mapping. Thus, the interpretation of both kinds of *-er* nominals is free for children (Agent, Instrument), as it is not restricted by underlying syntactic structure. Children still need to acquire how derived nominals inherit the argument structure from the original verb and how the arguments are mapped onto nominal syntax. Only then will they discover that subtle, but highly abstract variations in nominal syntax may have major implications for interpretation.

2 Background

Van Hout and Roeper (1998) have extended the theory of argument and event structure in syntax to the realm of morphology. They aim to account for the minimal pair in (1).

(1) a. The lawn-mower just walked in / broke down last week.
   b. The mower of the lawn just walked in / *broke down last week.

The compound *-er* nominal in (1a) is ambiguous between an Instrument and an Agent reading: it may refer to the device used for mowing a lawn or to the person who is engaged in the mowing. The phrasal *-er* nominal in (1b) on the other hand has only an Agent reading; it cannot refer to the Instrument used in lawn-mowing.

Van Hout and Roeper argue that this subtle contrast points to underlying morpho-syntactic differences and claim that phrasal nominals contain more syntactic structure than compound nominals. Their argument has three ingredients. (i) Deverbal nominals may contain a VP plus AspP and VoiceP projection (see Fu, Roeper & Borer, 2001 for a number of arguments that support this claim). (ii) Aspectual features, in particular [+telic], are checked by object movement to AspP (Van Hout, 1996). (iii) In VoiceP the Agent argument is introduced (Kratzer, 1994, cf. vP in Chomsky, 1995). Therefore, when telic predicates are involved, object movement to AspP must occur, also within derivational morphology. Moreover, an obligatory Agent interpretation reflects the underlying presence of

VoiceP, which is the locus of Agent arguments. On this line of argumentation derivational affixes such as *-er* (but also *-tion* and *-ing*) must project a VP ánd extend it with AspP for object movement in telic predicates like *mow the lawn*, as well as with VoiceP for the Agent argument. The thus introduced Agent variable must be bound and finds its referent in *-er*, yielding an unambiguous Agent reading for phrasal *-er* nominals. In contrast to such elaborate nominalization structures, compounds like *lawn-mower* involve a simple noun+ verb incorporation operation that prevents object movement and requires no extended VP projection inside the compound nominal. The object noun adjoins to the verb (e.g., *lawn+mow*) and this complex incorporates into *-er* to yield the compound form (*lawn+mow+er*). Since there is no VoiceP projection introducing an Agent argument, *-er* can be interpreted freely, e.g., as Agent (*teacher*), Instrument (*toaster*), Theme (*broiler*) or even without thematic relation in the case of non-deverbal *-er* nominals (*New Yorker*).

Van Hout and Roeper's proposal is illustrated in (2) where we have represented their VoiceP as vP following developments in the minimal program (Chomsky 1995).

(2) a. lawn-mower   b. mower of the lawn

Simple incorporation: Extended VP inside the nominal:
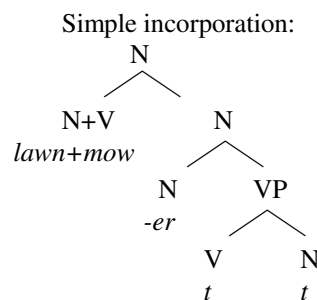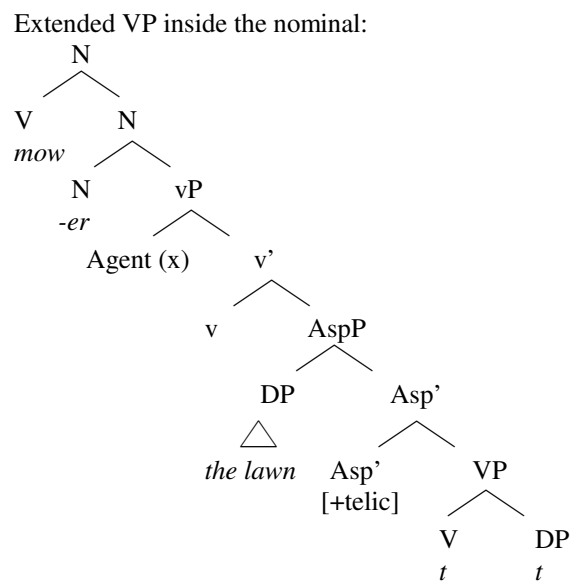
Thus the morpho-syntax of derived nominals poses strict limitations on their interpretation. If one assumes with Van Hout and Roeper that the syntax of argument structure (i.e., the introduction of an Agent in a specific syntactic position) and the syntax of event structure (i.e., object movement in order to check telicity) also apply in morphology, these interpretational effects find a natural explanation.

How do children use and interpret *-er* nominals? And do they know the subtle semantic contrast between phrasal and compound *-er* nominals? Bos (2004) examined all of Adam's *-er* words in the CHILDES database, determining their interpretation in the context. Adam uses deverbal *-er* nominals from the earliest file on (at age 2;3,4). They include both Agent and Instrument *-er* nominals; *camper, helper* and *driver* are examples of Agents and *blower, roller* and *carrier* are Instrument examples. Most of Adam's -er nominals are simple V+er forms. In addition there are a few are compound nominals (e.g., *lion tamer* and *ball player* are Agents and *airplane shooter* and *baby walker* are Instruments). Adam did not produce any phrasal *-er* nominals in the 27 files (up to age 3;3,0). Most of Adam's *-er* words were common words (such as *trailer, tape recorder, eraser, hanger, master, drummer, baker*); it might very well be that he uses them as unanalyzed words, i.e., without deverbal derivation.

Except for the observation that Adam uses Agent as well as Instrument *-er*, and that he is able to coin compounds, nothing much can be concluded on the basis of these data with respect to our questions about phrasal versus compound *-er* nominals. In order to find answers to our questions, we need to turn to controlled experiments instead.

Two studies have used experimental techniques to examine English children's *-er* nominals and the interpretations they allow for them. Clark and Hecht (1982) investigated this in an elicited production experiment with Agent and Instrument contexts. They invited children to coin new *-er* words by asking *I've got a picture here of someone who (*or: *something that) burns things. What could we call someone who (something that) burns things?*

Someone who (or: *something that*) *burns things is a ….* The experiment was divided in two parts to elicit Agents and Instruments separately. Clark and Hecht found three different stages of *-er* production:

(3) a. Phase 1 (around age 3): Inconsistent use of *-er*: simple *-er* nominals for Agents; some familiar *-er* words for Instruments (*cutter, toaster*); no compound forms.
     b. Phase 2 (around age 4): Consistent use of only one of the readings of *-er*, for most children the Agent reading.
     c. Phase 3 (around age 5): Correct use of both Agent and Instrument readings of *-er*.

Note that in the second stage, practically every child consistently used *-er* for only one reading, i.e., they did not allow for an ambiguous use of *-er*. Clark and Hecht argue that these results follow from a Principle of Transparency which claims that one-to-one matches of form/meaning are more transparent when interpreting new words, and suggest that children initially strictly adhere to this principle and do not allow any one-to-many mappings between words and meanings, i.e., no ambiguity. Moreover, on the basis of their Principle of Productivity the most likely interpretation for children's *-er* nominals is the Agent reading, since *-er* is used most productively to make Agents.

   Clark and Hecht's Principle of Transparency also explains 4-year-old Yara's remark to her mother that she is "*... the typewriter, that's the typewrite*" and 4-year-old Alexander's dialogue with his mother (Karmiloff & Karmiloff-Smith 2001: 79/80) in (4). Both children only allow an Agent reading for *-er*.

(4) Alexander: *I'm not the cook, I'm the cooker, Mummy. I'm the cooker today.*
     Mother explains that the stove is called the cooker.
     Alexander (furious):   *No, no, no, that's the cook, It's me the cooker.*

   These findings suggest that if one confronts children with a judgment task with Agent and Instrument pictures, as we did in our experiments, 3 and 4-year-olds will accept *-er* words only for one of the two pictures, most probably the Agent, but not the other. This should be independent of the different syntax of phrasal and compound nominals.

   In a comprehension study Randall (1982) tested children's interpretation of Agent *-er* nominals with PP modifiers using a picture -selection task. Surprisingly, for nominals such as *biker with no hands* the children (aged 3 up to 7;4, mean age 5;1) chose someone who bikes without using his hands, as well as a picture of a hand-less biker. Adults only chose the latter. Children apparently allow modifiers of *-er* nominals to modify the event expressed by the verb inside the nominal. This is not possible in the adult grammar according to which such modifiers only access the nominal referent. Randall concludes that children project the full argument structure as well as all adjuncts of the underlying verb in derived *-er* nominals. In the adult grammar, however, an *-er* nominal only inherits the underlying verb's direct argument, but no adjuncts. Randall formulates this as the Inheritance Principle: "A derived item inherits the full subcategorization of its base if it maintains either the category and/or the meaning of the base form. If both of these are unchanged [as in the case of *-er*, AvH & AB], the derived form inherits only the unmarked portion of the base verb's subcategorization" (p.70). In Randall's framework, unmarked subcategorization involves the underlying verb's direct argument (if it has one), and nothing more. The Inheritance Principle thus has the effect that in an *-er* nominal the underlying verb is not available for event modification and so any accompanying modifiers must target the noun referent, not the event. Children, according to this proposal, do not apply the Inheritance Principle properly.[1]

   All of Randall's pictures concerned Agents; she did not consider Instrument readings of *-er* nominals. All of her examples were simple *-er* forms; she did not consider compound *-er* nominals. These are two elements that we have incorporated in our experimental designs. Nevertheless, the findings of Randall's experiment may be relevant for our experiments, as they suggest that the underlying verbal meaning is actively present in children's representations of *-er* nominals, and, along with the verbal meaning, all of the underlying verb's arguments (Agent, Theme) as well as possible event modifiers (Instrument, Location, etc.) are implied. Extending this argument to our case of phrasal versus compound *-er* nominals, children are expected to allow Agent readings for both *-er* nominals, since an Agent is implied by the underlying verb. It is not clear, however, what predictions Randall's Inheritance theory would make for Instrument readings of *-er* nominals, since the theory does not address the issue of how one

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[1] Given the state of the art of present-day argument structure theory, Randall's (1982) background assumptions are no longer valid: modifiers are not part of a verb's argument structure (at the time: subcategorization frame), and even the Agent argument is no longer part of the argument structure; it is introduced into the derivation by certain syntactic structure (i.e., the head of vP) instead of through argument structure.

of the verb's modifiers— the Instrument—may become the referent of the *-er* nominal (in her items it is always the Agent argument that gets linked to *-er*).

Two studies have looked at children's use and interpretations of *-er* nominals: Clark & Hecht (1982) and Randall (1982).[2] Clark and Hecht's results suggest an overly restricted use of *-er* nominals, whereas Randall's results show an overly liberal interpretation of modifiers in *-er* nominals. Some 20 years later we are taking up the issue again. New insights in the morpho-syntactic theory of derived nominals suggest a novel angle and lead us to formulate our research questions accordingly. Focusing on argument linking in *-er* nominals, in particular, the issue Agent versus Instrument, we have two research questions. (i) Do children know that *-er* nominals in principle have two possible interpretations? (ii) If so, are they aware of the interpretational limitations that the syntax of derived nominals poses?

Randall's Inheritance theory only speaks to agentive *-er* nominals, and does not address the instrument readings that (some) *-er* nominals may also have. So, this theory does not provide any hypotheses with regard to our questions. On the other hand, Clark and Hecht's (1982) developmental Principle of Transparency is highly relevant for our questions. One hypothesis, following this principle, is to say that children will not accept both readings because they do not allow two meanings for *-er*: it is either Agent or Instrument. If *-er* has only one reading, the syntactic structure of the nominal probably will not be at issue: both phrasal and compound *-er* nominals will get that meaning. Moreover, given Clark and Hecht's Principle of Productivity which was supported by their results, one expects that children will only allow Agent interpretations. Children will thus differ from adults in that they will not accept the Instrument reading for compound nominals whereas adults will. We will call this the No-Ambiguous-*er* hypothesis.

Van Hout and Roeper's (1998) theory on the difference between phrasal versus compound *-er* nominals relies on a syntactic difference between the two: phrasal *-er* has an extended VP structure inside it, whereas compound *-er* is a simple incorporation structure, see (2). One implication of this theory is that if children do not project all of the relevant syntactic structure in a phrasal nominal, the two kinds of nominals become indistinguishable, because both would now be incorporation structures like (2a). Such children will accept both interpretations for both kinds of nominals, independent of their syntactic differences in the target grammar. These children will thus differ from adults in that they will incorrectly accept Instrument pictures for phrasal nominals. We will refer to this hypothesis as the No-Syntax-Inside-*er* hypothesis. Having established two hypotheses with opposing predictions, we now discuss our two experiments.

3 Two experiments on phrasal versus compound *-er* nominals

We designed two experiments that tested subjects' interpretation of phrasal and compound *-er* nominals. The first used a picture-selection task and the second a truth-value-judgment task. The method used in the first experiment targets subjects' preferred interpretations, whereas the second experiment brings out subjects' full interpretation of *-er* nominals, including preferred readings as well as possibly other, less preferred readings. The truth-value-judgment experiment is thus more informative given our research questions. In both experiments the visual material that needed to be chosen or judged consisted of pictures showing an Agent or an Instrument of an action. Both experiments are described in more detail in Bos (2004).

3.1 Picture -selection experiment

Subjects
35 Children participated in this experiment (as well as in the next one). They came from two different schools: 24 children from the *International School of Amsterdam*, and 11 children from the *Helen Sharmar British School* in Assen (both are international schools located in The Netherlands). All children spoke English as their first language.[3] The children ranged in age from 3;3,23 to 6;1,27 years old, with a mean age of 5 years and 2 months (5;2).

For the adult group, 15 native speakers of English participated in the experiment. The participants were students and professors at the University of Groningen as well as some visitors of a Groningen Irish pub.

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[2] As far as we know these two are the only experimental studies that have looked at *-er* nominals and the effects of argument structure in English learners.
[3] Some spoke other languages as their second language, but in every case, English was spoken at home.

Design, materials and procedure

In the picture -selection experiment subjects were shown two pictures portraying and Agent in action in some event and a typical Instrument used in such an event. Picture choice thus indicated which interpretation—Agent or Instrument—subjects liked best for a certain nominal. They were only given phrasal *-er* nominals, because this was the crucial form which should lead to Agent choices only in the target grammar. Compound nominals were not asked because in principle both pictures qualified (phrasal as well as compound forms were asked in the truth-value-judgement experiment though, see section 3.2).

The experiment consisted of nine picture pairs. Agent and Instrument pictures were alternately shown on the left and the right with no fixed side for either. The picture pair for *catcher of flies* is illustrated below. A list with all the phrasal nominals appears in Appendix 1.

(5) Which one is the catcher of flies?
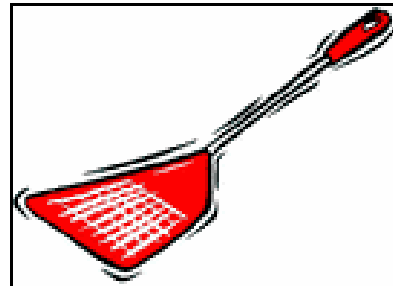
The children were introduced to a puppet called Marcel the Martian, who was visiting Planet Earth from Mars and whose English was not so good yet. The puppet was learning new words day by day and the child was invited to help the him with some new words. The experimenter asked the child: *Please tell Marcel which picture shows ... the catcher of flies*. Adult subjects were simply asked to point to the picture that shows *the catcher of flies*, without interference of the puppet.

Predictions

Given Van Hout & Roeper's (1998) theory, adults are expected to only accept Agents for phrasal nominals, i.e. to exclusively choose the Agent picture. The No-Ambiguous-*er* hypothesis expects each child subject to choose only Agents or only Instruments; a single subject should not vary her interpretation, i.e., sometimes choose an Agent and sometimes an Instrument. The No-Syntax-Inside-*er* hypothesis expects subjects to choose either one the pictures, as *-er* interpretation is free and does not predict any specific interpretational preferences.

Results and discussion

Both children and adults clearly preferred Agent interpretations for the phrasal *-er* nominals in the picture -selection experiment. The means of the picture choices are shown in Table 1.[4]

Table 1: Results picture -selection experiment: Mean percent of picture choice

	Children	Adults
Agent	71	88
Instrument	29	12

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[4] We actually had nine items in the experiment, but decided to leave one item (*carrier of bikes*) out of the analysis, because it turned out to be an outlier. As we will see below, Agent pictures were preferred overall, but here practically everybody chose the bike rack on a car, rather than the man who was carrying a bike on his shoulders.

What is remarkable about the adult data is that sometimes the Instrument picture was chosen after all, even if overall the Agent picture was preferred. We had not expected any Instrument choices for phrasal *-er* from the adults, so the 12% Instrument choices were a surprise. When we asked subjects afterwards what had prompted their choices, they often said that the Agent did not look like somebody who does it on a regular basis within the context of a job, and so instead subjects went for the other picture, because the Agent picture was clearly wrong in their judgment. In order to qualify as a *cleaner of floors*, for example, it is not sufficient to be sitting on the floor and scrubbing it. Rather, people expected somebody who is dressed like a typical cleaning lady (our picture showed a girl in a kind of school uniform). Apparently phrasal *-er* strongly draws out a habitual job reading, and, for lack of Agent pictures which showed someone in a proper job outfit, subjects sometimes went for the Instrument. Had we used pictures of Agents more typically dressed as people who perform a certain job, we might have gotten less Instrument choices. Alternatively, our initial assumption, based on Van Hout and Roeper (1998), that phrasal *-er* is necessarily an Agent is too strong, since sometimes exceptions were allowed.

Children also preferred the Instrument over the Agent by almost one third of the time. The Instrument choices came from all children, not from a few single individuals. This is a first indication that in principle children allow two interpretations for *-er*: Agent and Instrument. This was not expected by the No-Ambiguous-*er* hypothesis, but was expected according to the No-Syntax-Inside-*er* hypothesis.

3.2 Truth-value-judgment experiment

A picture-selection task tests subjects' preferences. Our results above show that subjects clearly favored an Agent interpretation for phrasal *-er* nominals. In order to find out if subjects are sensitive to the interpretational consequences of two different *-er* syntactic structures we designed a truth-value-judgment task.

Subjects
The same 35 children and 15 adults participated in this experiment.

Design, materials and procedure
In the truth-value-judgment experiment subjects were shown a series of individual Agent and Instrument pictures, and were asked to judge for each picture if it could be called an *X-er*, where we asked either phrasal or compound *-er* nominals. This experiment had a 2x2 design, varying picture (Agent, Instrument) by *-er* nominal (phrasal, compound). The dependent variable was the subject's judgment: *yes* or *no*.

(6) Design of truth-value-judgment experiment

	Agent	Instrument
phrasal *-er*		
compound *-er*		

The same pictures (and others) were used in this experiment. For any *-er* nominal, only one picture was shown, either an Agent or an Instrument We selected 12 clear Agent picturers and 12 clear Instrument pictures. For each of the four conditions in the design, there were six items, yielding 24 experimental items, plus 4 filler items, totaling 28 items. The fillers all required a *no* answer and were included to break a possible *yes*-strategy and to check whether subjects kept paying attention.[5] Two versions were constructed by varying the match between picture and *-er*-nominal: when in version A the compound form was asked for a given picture, phrasal *-er* was given in version B, and vice versa. Half the subject did version A; the other half did version B. For example, of the fly-catcher pictures in (5), only the Instrument picture was used in this experiment; the Agent picture was not. Subjects in version A were presented with this Instrument picture and asked about *catcher of flies*, whereas subjects who took version B were asked if it was a *fly-catcher*. The full list of items are listed in Appendix 2.

The same puppet from Mars was used in this experiment and children were asked to judge his descriptions of the pictures. The experimenter would point at a picture and say for Instrument pictures: *Look at this thing,* and for Agent pictures: *Look at this man/woman*. Marcel the Martian then described an Instrument picture as follows: *Oh,*

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[5] A pilot study had revealed that children overwhelmingly accepted both *-er* nominals with both kinds of pictures, giving almost exclusively *yes*-answers.

I know what that is. It is a ... X-er. For Agent pictures he said: *Oh, I know what he/she is. He/she is a ... X-er*. On the dots Marcel used either a phrasal *-er* or a compound *-er*. Children were then asked to judge whether or not Marcel was right. Adults were instructed (without the puppet) to judge whether one might call this thing (for Instruments) or this person (for Agents) an X-*er* while the experimenter was pointing at a picture. In fact, it turned out to be quite difficult to instruct the adult subjects properly, because they often wanted to give an alternative label for the thing or person as they "... *would never call it that way*". In those cases the experimenter admitted that one would typically call the indicated thing or person a Y, but could one also call it a X-*er*? This problem did not occur with the children.

Both experiments were run one after the other: first the truth-value-judgement experiment, then the picture-selection one. It took about 10-15 minutes to complete both experiments.

Predictions
Van Hout and Roeper's theory expects adults to accept three conditions except the combination of phrasal *-er* with Instrument pictures, since these are claimed to give exclusive Agent readings. In (7)-(8) the check mark ✓indicates acceptance and the cross ✗ indicates rejection.

(7) Expectations based on adult grammar:

	Agent	Instrument
phrasal *-er*	✓	✗
compound *-er*	✓	✓

Let us also spell out the predictions of the two hypotheses under investigation for this experiment: the No-Ambiguous-*er* hypothesis and the No-Syntax-Inside-*er* hypothesis. For simplicity let us assume that children only accept *-er* Agents under the No-Ambiguous-*er* hypothesis. Subjects are thus predicted to accept both Agent conditions, and reject both Instrument conditions, independent of the type of *-er* nominal. Under the No-Syntax-Inside-*er* hypothesis children will not differentiate the two kinds of *-er* nominals because each has a simple verb incorporation structure with no restrictions on interpretation. Subjects are thus predicted to accept all combinations.

(8) Predictions of two hypotheses

No-Ambiguous-*er* hypothesis:

	Agent	Instrument
phrasal *-er*	✓	✗
compound *-er*	✓	✗

No-Syntax-Inside-*er* hypothesis:

	Agent	Instrument
phrasal *-er*	✓	✓
compound *-er*	✓	✓

Results and discussion
Tables 2 and 3 present the mean percent of acceptance of a Agent or Instrument picture with a phrasal *-er* or compound *-er* for children and adults, respectively.

Table 2: Results of truth-value-judgment experiment: Mean percent acceptance in children

	Agent	Instrument
phrasal *-er*	84	84
compound *-er*	89	87

Table 3: Results of truth-value-judgment experiment: Mean percent acceptance in adults

	Agent	Instrument
phrasal *-er*	50	32
compound *-er*	67	57

A quick look at the numbers in the two tables suggests that children are very accepting of both phrases with either picture and do not seem to differentiate the two forms, whereas adults are much less accepting overall and accept phrasal *-er* for Instrument pictures least of all. General linear model (GLM) analyses confirm these observations.

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A multivariate GLM test with repeated measures on the child data yields no significant effects (F=.069, df=1, p=.794). The adult data on the other hand do show effects: a multivariate GLM test with repeated measures reveals that there is an effect of *-er* nominal (F=11.864, df=1, p=.004) and of picture (F=7.054, df=1, p=.019), but no interaction (F=.199, df=1, p=.662).

The children almost always accepted all of the *-er* nominals. This was predicted by the No-Syntax-Inside-*er* hypothesis, but not by the No-Ambiguous-*er* hypothesis. Only occasionally did a child not like a particular item for a particular picture. Some of their remarks at rejecting an item suggest that they prefer an Agent reading for-*er*, in line with what we found in the picture-selection experiment. For example, with the fly swatter, one child said *"There has to be a person, other wise it can't catch flies"* (E. 5;7), and when confronted with a picture of a pizza oven, another one said: *"Pizzamaker, hmmmmm, but where's the man?"* (R. 4;6).

As for the adults, we found effects of form on interpretation, although not always quite as expected. First of all, the overall acceptance of (both kinds of) *-er* nominals was rather low (nowhere over 67%), whereas we had expected full acceptance for three of the four conditions. Moreover, adults did accept phrasal nominals for Instruments to a surprisingly large extent (32%), where we had expected rejection across the board. And finally, we had predicted an interaction of form and interpretation, since we were expecting rejection in one of the four cells, but we did not get it. Instead we found that the adults accepted both kinds of *-er* nominals less for Instrument pictures than for Agent pictures, and they accepted compound nominals more so than phrasal nominals.

The adult results merit some more discussion. The overall low acceptance of the *-er* nominals relates to the fact that the adults in general found it hard to judge our *-er* nominals because very often they would use another label for the thing or person we were pointing at and reject our label. For adults the "real" labels for objects and people thus stood in the way of judging ours. Still, despite the overall low acceptance, a significant pattern emerged in the adult data and it points out the combination of phrasal *-er* with Instrument picture as the worst of the four, as we had expected. Why did the adults accept this combination at all? It may be that, since they did not particularly like our test items and found them rather awkward, their judgments were not as accurate across the board. An indication that something to this effect may have affected adults' judgements comes from interviews with some of the subjects after the experiment, when we explained what the goal of our study was. At that point all of those subjects agreed that phrasal nominals must refer to people, Agents, and may not refer to things, Instruments. With better pictures and more straightforward instructions, the experiment might be improved and results from adults may possibly show a pattern that is more along the lines of what was expected.

The most important conclusion is that children are not sensitive to the semantic consequences of different *-er* nominals, but adults are. The children's results thus support the No-Syntax-Inside-*er* hypothesis, and falsify the No-Ambiguous-er hypothesis.

4 Discussion and conclusions

Taking the observation in linguistic theory that the syntax of derived *-er* nominals puts restrictions on their interpretation as our starting point, our study asks if children are sensitive to these restrictions. In a truth-value-judgment experiment we found that they are not. For both children and adults compound *-er* nominals such as *leaf sweeper, fly catcher* and *music maker* may refer to Agents or Instruments. On the contrary, phrasal *-er* nominals like *sweeper of leaves, catcher of flies* and *maker of music* must refer to Agents, and may not refer to Instruments. This is indeed the pattern we found in the adults, but not so for the children, who allowed both kinds of picturers with phrasal *-er*, not distinguishing it from compound *-er*.

Our results speak to two contrasting hypotheses. The No-Ambiguous-er hypothesis, based on Clark and Hecht's (1982) Principle of Transparency, claims that children will only allow one reading for *-er*, either Agent or Instrument. Our results do not support this hypothesis, as children allowed both interpretations. Alternatively we formulated the No-Syntax-Inside-*er* hypothesis based on Van Hout and Roeper's (1998) analysis of phrasal versus compound nominals. In this analysis the two kinds of nominals differ crucially in their syntactic make-up: phrasal *-er* nominals have an extended VP structure inside them, which determines that they must refer to Agents. Compound *-er* on the other hand is a straightforward incorporation structure in which the object noun incorporates into the verb and the noun+verb complex incorporates into *-er*. In such nominals interpretation is unrestricted and Agent and Instrument readings are allowed. The No-Syntax-Inside-*er* hypothesis claims that children do not project an extended VP inside *-er* nominals. According to this hypothesis, children are predicted not to distinguish the two kinds of nominals and accept all readings. This is exactly the pattern that we found.

We conclude that the children's representations of phrasal *-er* nominals are not sufficiently developed to derive the relevant semantic limitations that these nominals pose. Our results contributes to a slowly growing body of literature that shows that children's nominal syntax and their effects for argument structure is not fully acquired.

Children are too liberal in their interpretation of nominal syntax. Randall (1982) found that children allowed PP modifiers in *-er* nominals like *biker with no hands* to modify the underlying verb instead of the noun referent. Johnson et al. (1996), who examined children's interpretations of noun phrases such as *the crowning of him*, found that children allowed *him* to be an Agent (choosing a picture in which he is doing the crowning), whereas for adults it can only be a Theme (he is being crowned). Similarly, for noun phrases like *the bowl of chrystal*, children, but not adults, allowed a Possessor interpretation of the *of* PP (i.e., Chrystal's bowl). These experiments also show that children's nominal syntax is not yet properly mapped to argument structure, and, even beyond the domain of derived nominals, children have not developed a full-fledged their syntax-semantics interface.

Children still need to acquire how exactly derived nominals inherit the argument structure from the underlying verb and how the arguments are mapped onto the nominal syntax and how they cannot be mapped. Only then will they learn that subtle, but highly abstract variations in nominal syntax may have major implications for interpretation.

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Appendix 1: Items in Picture-Selection Experiment

1   Carrier of boxes
2   Carrier of bikes
3   Cleaner of floors
4   Catcher of flies
5   Digger of holes
6   Kneader of dough
7   Maker of clothes
8   Lighter of candles
9   Peeler of potatoes

Appendix 2: Items in Truth-Value-Judgment Experiment

	Compound _-er_	**Phrasal _-er_**
1	Furniture carrier	Carrier of furniture
2	Bread toaster	Toaster of bread
3	Floor cleaner	Cleaner of floors
4	Magic maker	Maker of magic
5	Bike carrier	Carrier of bikes
6	Chicken fryer	Fryer of chicken
7	Box carrier	Carrier of boxes
8	Fly catcher	Catcher of flies
9	Hole digger	Digger of holes
10	Wood cutter	Cutter of wood
11	Shrub cutter	Cutter of shrubs
12	Dough kneader	Kneader of dough
13	Glass holder	Holder of glasses
14	Candle lighter	Lighter of candles
15	Cloth maker	Maker of clothes
16	Fish catcher	Catcher of fish
17	Mountain climber	Climber of mountains
18	Music maker	Maker of music
19	Leaves sweeper	Sweeper of leaves
20	Pizza maker	Maker of pizzas
21	Ball slammer	Slammer of balls
22	Potato peeler	Peeler of potatoes
23	Water pourer	Pourer of water
24	Car washer	Washer of cars