Verbs come with arguments: an argument from the language-acquiring child
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Background: There is ongoing debate about the nature of roots (e.g., see *Theoretical Linguistics 40* (2014)). According to some researchers, roots lack semantic content and category information and cannot take arguments (e.g., Borer 2014 *TL*). For others, roots might have semantic content and/or may take a complement (e.g., Harley 2014 *TL*, but also Harley and Noyer 2000, Ramchand 2008). Under lexicalist approaches, the semantic content or argument structure of verbs is specified in the lexicon (and can thus constrain syntactic projection) (e.g., Levin and Rappport Hovav 1995, Reinhart 2016). This paper presents an argument from language acquisition that supports the view that verbs cannot be stripped of all lexical content; rather, distinct root types exist in the lexicon. In particular, there are minimally two different types: unaccusative roots that introduce an internal argument and unergative roots that do not.

Learnability: Children need to work out that the class of intransitive verbs is partitioned into verbs for which the subject is an internal argument (unaccusatives (*slip*)) and verbs for which the subject is an external argument (unergatives (*laugh, sparkle*)) (Perlmutter 1978). Even though these verb types project different underlying structures, they give rise to the same surface N-V strings (in English for instance) (see (1)). As such, the set of intransitive verbs poses a learnability puzzle: how does the child figure out that the underlying structures for the surface strings in (1) are distinct (e.g. Reinhart 2000)? This is particularly pertinent in languages like English which lack morphological marking of unaccusativity and in which syntactic evidence for internal argument-hood is sparse. The child's input consists of N-V strings, so syntactic bootstrapping is of no help (even if they could work out which little *v* is projected in one case, this would not exclude the possibility of combining the root with a different little *v* if there is no information in the root that constrains the functional structure it can be combined with). As the examples in (1) indicate, animacy does not cut across the verb classes either. Furthermore, for the child to rely on unaccusativity diagnostics, such as passivization, requires the child to make use of (indirect) negative evidence, which is a dangerous assumption to make (Yang 2016).

(1a) [TP [the boy]i [vP [slipped ti]]] - *unaccusative*
(1b) [TP the boyi [vP ti [laughed]]] (1c) [TP [the diamond]i [vP ti [sparkled]]]. - *unergative*

Constrained productivity: If nothing in a (verbal) root informs the child which structures (or little *v*'s) are and are not compatible with it, then it becomes unclear how the child will acquire constraints on the combination of a particular root with particular functional structure; i.e. we would reintroduce Baker's paradox of constrained productivity (cf. Pinker 1984, 1989). From a learnability perspective, therefore, it seems necessary that a verb contains information about how it projects. In two experiments, we show that 4-year-olds have subtle knowledge about verb classes, namely (i) 4-year-olds know that non-alternating unaccusative verbs are related to an external cause, but theme unergatives are not, and (ii) children distinguish between verbs that do and do not introduce an argument even when these verbs are presented in the same (incompatible) functional structure.

Experiment 1: In a first experiment (in Dutch), we investigated whether 4-year-olds know that a CAUSE (projection) is related to unaccusative verbs (*sink*), but not to theme unergative verbs (*stink*). This property makes unaccusatives, in contrast to theme unergatives, compatible with the phrase 'vanzelf' *by itself* which in Dutch unambiguously expresses the meaning *without external cause/force*. The results of a felicity judgment task in which 25 children were presented with sentence pairs as in (2) showed that children reliably (b=-1.13, p<.005) differentiated between verb types, correctly providing more 'silly' answers for

Figure 1 UA=unaccusative UE = unergative
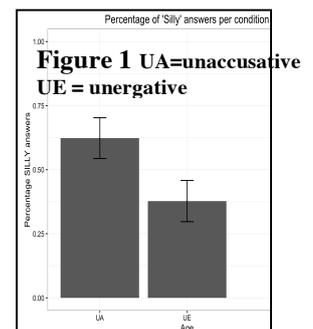
unergative (2b) than unaccusative (2a) sentences (see Fig.1). An adult control group judged the (2b) sentences to be *silly* in 95% of the cases.

(2a)   De schoen zonk vanzelf   (2b)   *De schoen stonk vanzelf
         The shoe sank by-itself   *The shoe stank by itself

If there would be no inherent distinction between the root types, it is mysterious how children come to know that the verb types differ in whether 'vanzelf' can be added.

Experiment 2: In a second experiment, we addressed the question as to whether children distinguish between root types when they are embedded in the same functional structure. In the experiment, a puppet produced sentences with intransitive verbs, in a transitive structure. Example test sentences are given in (3)-(4). The task was designed to assess the meaning that children assigned to the (ungrammatical) test sentences (cf. Deal 2007, for adults). On different trials, the child participants encountered sentences with an unaccusative (change-of-state) verb (e.g., *slip*), or ones with an unergative verb (e.g. *laugh*) in an (ungrammatical) transitive structure. The null hypothesis – that there is no intrinsic difference between roots - would predict that we would see no differences in how the resulting meanings were represented by children. We would expect differences, however, if there were an intrinsic difference among verb roots (i.e., unaccusatives, but not unergatives, introduce an internal argument). The reasoning here is that a CAUSE projection can be combined with argument-complete VPs (a verb with an internal argument), but not bare verbs in English (Deal 2007).

As such, transitive unaccusatives lend themselves more easily for causativization than transitive unergatives. In the experiment, the child participants (17 4-year-olds, mean 4;6) were asked to choose between two meaning options: a causative structure or a PP-structure, as illustrated in examples (3)-(4) (4 items per condition). The main finding was that verb type resulted in a significantly different distribution of causative versus PP structures (a multilevel regression analysis displayed a significant effect of condition on answer type: $b=-1.43$ (0.61), $p<.05$; see Fig.2). More specifically, unaccusative verbs evoked more

Figure 2: Different distribution of response type per instransitive verb type.

causative answers than PP answers, whereas unergative verbs evoked more PP answers than causative answers.
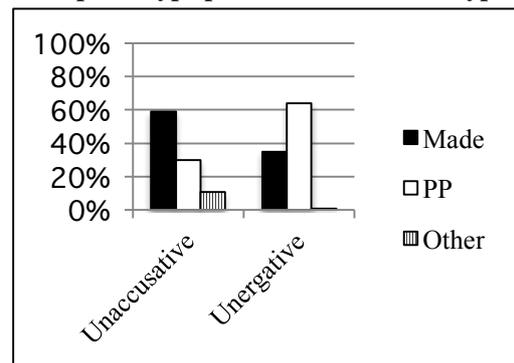
(3)   Yesterday, I slipped a friend.
        Answer options: Causative (made): Yesterday, I made a friend slip.
                              PP: Yesterday, I slipped over a friend.
(4)   Yesterday, I laughed a friend.
        Answer options: Causative (made): Yesterday, I made a friend laugh.
                              PP: Yesterday, I laughed at a friend.

Interpretation: In conclusion, 4-year-old children displayed subtle knowledge of verb classes. They differentiate between root types that take an internal argument and ones that do not. Crucially, these experiments show that children's willingness to adjust a verb's meaning to fit a structure (syntactic bootstrapping) varies as a function of the verb's (semantic) properties. This suggest that it is not the case that the construction itself carries a significant part of the meaning (contra Goldberg 1995, Harley and Noyer 2000), but that these effects result (backwards) from children's (innate) knowledge about (restrictions on) the syntax-semantics mapping (Landau & Gleitman 1985, Pinker 1989, Lidz et al. 2001, contra Goldberg 1995). Moreover, this presupposes that roots constrain syntactic projection and thus the existence of different root types in the lexicon: (minimally) roots that do and roots that do

not introduce an internal argument.