

# Research that inspired me: *Lesley Jeffries*

## The Child's Learning of English Morphology

Jean Berko

**W**hen I was a linguistics student in the 1970s (University of Reading, UK), there were a few outstanding examples of research projects which I have revered ever since, for their simplicity, their rigour and their creativity. An article published by Jean Berko in 1958 investigating how children learn English morphology is one of those that inspired me then and remains inspiring now. Here is a summary of the project and what Berko discovered.

### What was the project trying to find out?

Berko and her colleagues were trying to find out how the knowledge and use of English morphology is learned and evolves during childhood. For example, they were interested in the question of whether the regular forms are learned first and the exceptions or irregular patterns later. Are these forms learned as generalised 'rules' – i.e. as a process such as *add 's' to a noun to get a plural version of that noun* – rather than as lists of individual items? The intention was, therefore, to shed some light on the psychological reality (or otherwise) of the descriptions that linguists were using to characterise language. This article was written at a time when linguistics was beginning to think about the cognitive aspects of language use and as Berko says, "It is evident that the acquisition of language is more than the storing up of rehearsed utterances, since we are all able to say what we have not practiced and what we have never before heard." This feature of human

language – the ability to produce novel utterances – was labelled 'creativity' by Hockett and refers not to the creativity of poets and novelists but the everyday creativity of ordinary speakers in producing utterances they have never said before.

### How did the project go about it?

This is the good bit! Berko and her colleagues realised that if they tested children's knowledge of English morphemes on real words, they would not be able to distinguish between those they had learnt individually and those where they were applying a 'rule' such as *add 's' for plural*.

So, they decided to invent some words and then test the children using those invented words to see if they naturally used various aspects of English morphology. The interesting thing about this is that children are constantly meeting new words in their everyday lives and this means that the task being set them was not unusual or peculiar. Much of their school work involves being asked to do, by adult standards, fairly pointless tasks so children are less likely than adults to find the research tasks odd and behave differently to usual as a result. This minimises the effect of the 'observer's paradox', whereby there is a danger that the very act of observing human behaviour produces the risk that the behaviour will change. Think of how you behave when you suddenly notice that someone is pointing a camera at you – it's hard to act normally.

So, children are quite used to being set pointless tasks and being observed in carrying them out. They are also used to meeting new words,

which they may recognise as ‘made up’, as in the books they read, but this is not a problem for them. The testing itself will be described a little later.

The main morphemes that were tested in this experiment were the plural and possessive inflections on nouns, the third person singular on present tense verbs, the progressive (-ing) form of the verb and the past tense (-ed) of the verb and the comparative (-er) and superlative (-est) of the adjective. Here is Berko’s description of the phonological variants of these morphemes:

The productive allomorphs of the plural, the possessive, and the third person singular of the verb are phonologically conditioned and identical with one another. These forms are /-s -z -əz/, with the following distribution:

- /-əz/ after stems that end in /s z ʃ ʒ ʃ ʒ/, e.g. glasses, watches
- /-s/ after stems that end in /p t k f θ/, e.g. hops, hits
- /-z/ after all other stems, viz. those ending in /b d g v ð m n ŋ r l/, vowels, and semivowels, e.g. bids, goes.

The productive allomorphs of the past are /t ~ d ~ əd/, and they are also phonologically conditioned, with the following distribution:

- /-əd/ after stems that end in /t d/, e.g. melted
- /-t/ after stems that end in /p k ʃ f θ ʃ/, e.g. stopped
- /-d/ after stems ending in voiced sounds except /-d/. e.g. climbed, played

The progressive -ing and the adjective -er and -est do not have variants. It might also be noted that the possessive has an additional allomorph /-Ø/; this occurs after an inflectional /-s/ or /-z/, so that if the form *boy* is made plural, *boys*, the possessive of that plural form is made by adding nothing, and indicated in writing only by the addition of an apostrophe: *boys’*.

Berko established that children of 4-5 years old tend to have at least some of these inflectional forms in their vocabulary, so it was worth testing for their cognitive status (i.e. to see if they are already remembered as ‘rules’). Derivation and compounding are less evident than inflection, but there were thought to be enough examples of the blackboard/blackbird type (compounding) and the addition of suffixes -y and -er to warrant testing these too.

**Inflection** – regular endings which apply to many items and which change the grammatical significance of a word, but not its word class or its semantic meaning. These are limited in English to:

- Verbs – suffixes showing tense (past -ed), participles (continuous = -ing; perfect = -ed or -en), person (3<sup>rd</sup> person = -s)
- Nouns – suffixes showing plurality (-s/-es), possession (’s)
- Adjectives and Adverbs – suffixes showing comparative (-er) and superlative (-est) scope

**Derivation** – less regular affixes which apply to some but not all or even most of the items in a class, but which (normally) change the word class and often alter the semantic meaning considerably. The following are a few of many examples in English:

- Noun to adjective – danger + ous = dangerous, fuss + y = fussy
- Adjective to adverb – dangerous + ly = dangerously
- Noun to verb – hammer, google (no affix – just a change of word class - this is known as ‘zero derivation’)
- Verb to noun – bake + r = baker, compute + r = computer (notice that one is a person who does the action and the other is an item which can be used to do the action).

**Compounding** – relatively unpatterned combinations of two or more lexical items to make a compound where the final item dictates the word class of the whole. Here are a few examples in English:

- Noun + noun – shoe rack, headlight
- Adjective + noun – blueprint, greenhouse
- Noun + verb – ice-skate, road race
- Noun + adjective – king-size, sky blue

Berko and her team invented a number of words, using regular phonological patterns from English and drew brightly coloured cartoon-like pictures to represent the referents of these words on cards. A line of text with a gap for the desired form was also written on the cards. Below you can see one of the original cards, with the most famous of the nonsense words, \*wug (the asterisk is used in linguistics to indicate an invented or unattested word form).



This is a WUG.



This is a very tiny WUG. What would you call a very tiny WUG? \_\_\_\_\_  
This WUG lives in a house. What would you call a house that a WUG lives in? \_\_\_\_\_



This is a glass.



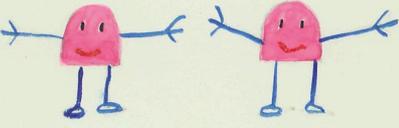
Now there is another one.  
There are two of them.  
There are two \_\_\_\_\_.

The experiment was carried out on two groups of children, one preschool group aged 4-5 and the other (first grade) group aged 5-7 1/2. The experimenter would point to the picture and read the text, leaving a gap for the child to fill in the missing word. The response was noted phonemically (i.e. pronunciation as well as the form). The child was also asked why s/he thought that some (existing) compound words were called that (i.e. why is a blackboard called a blackboard?)

There were 27 cards and 28 questions in all. Here are a few examples of the questions in addition to the plural \*wugs one above:



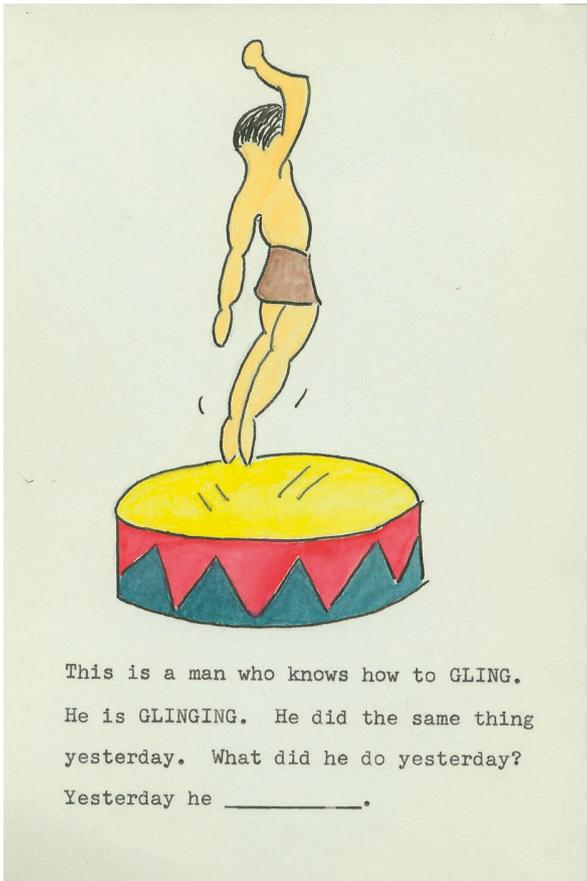
This is a KAZH.



Now there is another one.  
There are two of them.  
There are two \_\_\_\_\_.



This is a man who knows how to SPOW.  
He is SPOWING. He did the same thing yesterday. What did he do yesterday?  
Yesterday he \_\_\_\_\_.



Observant readers will notice that one of the questions uses a 'real' word, 'glass'. There are some other similar questions amongst the nonsense words, which allowed the experimenters to establish whether that individual child had acquired the relevant form of an actual word. In some cases, of course, they may know the form of a real word without having generalised this to become a rule that they can apply to newly acquired words. This experiment captures this kind of halfway stage of language learning brilliantly.

The success of the methodology is captured in the summary in Berko's article where she points out that all the children asked understood the tasks and in some cases they seemed to believe they were being taught real words. Berko adds "Answers were willingly, and often insistently, given"!

One last thing about the methodology. A number of first language speaking adults were also asked the questions, to establish an adult 'norm' against which the children's answers could be measured. It was not taken for granted that the researchers' assumptions about the 'correct' forms would be shared. Where the adults varied, it was where there were analogous, but irregular forms such as leaf-leaves for \*heaf-heaves (\*heafs).

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#### What were the results?

Berko and her team compared girls and boys for their achievement on the tests and found no (statistically) significant difference between the stages of the genders in acquiring morphology, despite the evidence elsewhere of girls' superior language abilities at a young age.

Some of the results are quite complicated, because there were details of phonology built into the nonsense words which tested subtle abilities. For example, getting the right plurals for \*wug and \*bik does not in itself evidence children choosing the right (voiced or voiceless) sibilant sound because English phonology allows no choice after plosive sounds and the voicing will automatically match the final consonant of the nonsense word (see the centrefold of this issue for explanation of terms). In the case of \*cra and \*lun, however, this phonological habit is not helpful and the child would need to know that the plural requires a voiced (-z) sound, even though it is perfectly possible in English to follow a vowel or a nasal with a voiceless sibilant (for example in 'class' or 'once'). Berko's results demonstrated a marked (and statistically significant) difference in their ability to form the correct plural of \*cra and \*lun, though their failed attempts tended to be either no additional morpheme (i.e. a repeat of the singular form) or silence.

In the case of \*heaf, 42% of the adults used the analogous form \*heaves for the plural, on the lines of 'knives', 'hooves' and 'rooves'. A majority of the children gave a correct answer, but usually the regular form (\*heafs). Only 3 out of 89 used \*heaves and 4 children misapplied the phonological rule, assuming that /f/ belongs to the group of word-final sounds requiring an additional syllable, and giving the answer /hiyfəz/. In general, however, the additional syllable version of plural, such as you get with words like 'glass(es)', was much lower in its success-rate at both the preschool and first grade ages, so this rule seems to be learnt later, even though some individual forms may have been learnt with 'real' words.



Jean Berko with a 'Wug'

Other results show that the -ing (progressive) form of the verb is the most successfully applied to new words (\*zibbing) and both groups can handle the /-t/ and /-d/ forms of the past tense (\*ricked; \*glinged), though the older group has (significantly) higher scores for this form, showing a developmental process during these years. Note that it is much more common for English verbs ending in 'ng' (ŋ) to have past tenses formed irregularly (sang, rang etc.) but very few children produced such forms, though the adults produced \*bang (for past of \*bing) and \*glang (for past of \*gling) in large numbers.

The derivation and compounding questions produced some of the most memorable answers, and included what you would call a man who \*zibbed for a living, what to call a very tiny \*wug, what you would call a \*wug's house and how you would describe a dog covered in \*quirks.

The answers from the adults were unanimous for \*zibber but only 11% of the children gave this answer, the rest giving no answer or choosing compounds like \*zibbingman, \*zibman or real words relating to the picture, such as clown or acrobat. For the diminutive \*wug, 50% of adults chose \*wuglet and also came up with \*wuggie, \*wugette and \*wugling. None of the children used a suffix, choosing instead to add an adjective like little or tiny. Two, however, used sound symbolism to change the central vowel in \*wig, which demonstrates how early the iconic aspects of

language are inculcated (see Language in the News, this issue, for a recent report on how vowels can have iconic meaning). The \*wug's house for adults was often (58%) \*wughouse, though they also produced words like \*wuggery and \*wughut. The younger children did not really understand this question and where the older children did, they said \*wughouse (18%) or used existing words such as 'birdcage'. For the dog, all adults used \*quirky and none of the children produced this form, though some of them (64%) produced a phrase \*quirk dog.

As for the final question, about existing compound words, children demonstrated a range of private meanings for these words which seems to imply an active production of explanations for language. Here are a few examples:

"Breakfast is called breakfast because you have to eat it fast when you rush to school."

"Thanksgiving is called that because people give things to one another." (Thanksgiving?)

"Friday is a day when you have fried fish."

### Why was it so inspirational?

There is a great deal more detail and information in the original article by Berko, which we don't have space for here. I wanted to share this piece of research with Babel readers because to me it symbolises the strengths of linguistics at its best. These are the reasons I value it so much:

1. It is rigorous, scientific work with clear research questions and clear methods for answering them.
2. It is inventive in its approach to minimising the difficulties of studying the human 'animal' in its natural habitat. Thus, it reduces the impact of the observers' paradox by making the experimental tasks match aspects of the everyday life of the subjects.
3. It is joyfully imaginative and humorous, demonstrating that research can be both serious and fun. ¶

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#### Online

Read Jean Berko Gleason's original article in full: <http://childes.talkbank.org/topics/wugs/wugs.pdf>