Fast mapping between grammatical constructions and meaning: An experiment in French children aged 3 to 4

Christophe Parisse[1], Fanny Dupont[2], Françoise Bourdoux[2], Christelle Maillart[2]

Modyco – Inserm/Paris X Nanterre, Paris, France

University of Liege, Belgium

Contact: cparisse@u-paris10.fr

Construction grammar (Goldberg)

Goldberg (1995): « C is a construction if C is a form-meaning pair 〈Fi,Si〉 such that some aspect of Fi or some aspect of Si is not strictly predictable from C's component parts or from other previously established constructions ». Within this approach, any language form that has an interpretation (any linguistic behaviour) is a construction (more precisely an occurrence of a construction). Constructions cover a wide range of size and complexity, from the most simple (lexical items), to the most complex (discourse organisation). In the middle, there are the syntactic constructions. Syntax is not just a way to order properly the elements of a phrase or a sentence (the form part Fi), it also adds additional meaning to the elements (other constructions) it links together (the meaning part Si).

Examples of constructions

Basic constructions (lexical elements)	'glisse'	SLIDE	'slice'	SLICE
Verb phrase	il glisse	INTRANSITIVE + HE SLIDES	he sliced the bread	TRANSITIVE + HE SLICED + THE BREAD
Verb phrase	il glisse un livre à Marie	DITRANSITIVE + HE SLIDES + MARIE + A BOOK (give with sliding)	he sliced Chris a piece of pie	DITRANSITIVE + HE SLICED + CHRIS + A PIECE OF PIE

If learning of associations between form and meaning is widely attested and described for lexical items (the most simple constructions), few work has been done on the learning of association between (novel) word order and (novel) meaning, although this is something that children have to when naturalistically learning language. A demonstration of real time learning of form-meaning pairing involving abstract grammatical forms (word order) was proposed by Casenhiser and Goldberg (2005). They proposed an experiment where children had to learn to associate 'a novel pattern involving known words arranged in a non-English word order along with a nonsense verb' and a meaning which was 'that of APPEARANCE (a meaning novel for English phrasal patterns): the entity named by the first noun phrase comes to exist in the place named by the second noun phrase' (from Goldberg, 2006, p. 79-80).
The form-meaning pairing experiment of Casenhiser and Goldberg (2005) contained 16 video items that constituted the training phase and lasted around 3 minutes. They tested 51 children aged 5-7 on 6 test trials and 6 filler items and obtained significant results that showed that 'children were able to glean the novel abstract meaning that was associated with a novel formal pattern involving novel verbs and extend what they had learned to *new* utterances that used *new* novel verbs' (from Goldberg, 2006, p.81-82).

Goal of the experiment

The goal of the current experiment was to try to reproduce these results with French-speaking children. Casenhiser and Goldberg series of experiments (Goldberg & Casenhiser, 2004; Casenhiser & Goldberg, 2005) contains more than a single experiment. Especially, they tested different types of input frequency (balanced input vs. skewed input; adults vs. children). For the current work, the idea was take into account their results and use the best experimental condition. Also, the test was done with younger children than Casenhiser and Goldberg (2005), 3-4-year-olds instead of 5-7-year-olds. The reason for this was double: (1) Casenhiser and Goldberg obtained better results for children than for adults, so it is possible that younger children are better at learning new patterns; (2) very young children demonstrate the ability to learn word patterns very early in life so this should be a natural task for them.

References

Casenhiser, D., & Goldberg, A. E. (2005). Fast mapping between a phrasal form and meaning. *Developmental Science*, 8(6), 500-508.
Goldberg, A. E. (2006). *Constructions at Work: The Nature of Generalization in Language*. Oxford: Oxford University Press.
Goldberg, A. E., Casenhiser, D. M., & Sethuraman, N. (2004). Learning argument structure generalizations. *Cognitive Linguistics*, 15(3), 289-316.
Khomsi, A. (2001). Evaluation du langage oral, ECPS, Paris.
Lambert, E. & Chesnet, D. (2001). Novlex: une base de données lexicale pour les élèves de primaire. L'Année Psychologique, 101, 277-288.
Lété, B., Sprenger-Charolles, L., & Colé, P. (2004). MANULEX : A grade-level lexical database from French elementary-school readers . Behavior Research Methods, Instruments, & Computers, 36, 156-166.

Experiment

Subjects

All children were recruited in kindergarten. They come from the two first years of kindergarten. Their age ranged between 3;4 and 5;1. The average age for the 49 participants was 4;0. The language of all children was evaluated using a standardised test battery (Evaluation du langage oral – ELO: Khomsi, 2001). All children had normal language development.

Material

The material presented to the children tried to reproduce as close as possible the material from Casenhiser and Goldberg (2005). Film clips were created for the training and testing phase. Two types of film clips were created:

Apparition film clips: there are small duration film clips (around 10-12 seconds) that show a scene where there is an object that can be described using a single word, and after around 6 seconds, an object suddenly appears (apparition could be natural – falling from the top of the picture, appearing behind a curtain – or created by a special effect).

Apparition

Transitive film clips: there are used as distractors during the test phase. In these film clips, all objects are present since the beginning and one object interact with the other. The important thing is that there no apparition of object in these elements.

Setting for transitive verbs

Nonce verbs

Real verbs were extracted from lexical databases (*Manulex*: Lété et al., 2004; and *Novlex*: Lambert & Chesnet, 2001) and check for frequency. All verbs were frequent and had a simple syllabic structure. Nonce verbs were created by changing two phonemes of each verb, one consonant and one vowel, with changes reduced to a single phonological feature. The nonce verbs were controlled using a questionnaire to ensure that they had no phonological neighbours. All nonce verbs used are considered as belonging to the first grammatical group of French verbs (ending in –er), which contains only regular verbs and which is the only productive group of French verbs.

|			
badocer	boganler	batenrer	bauler
chonder	fener	laner	muder
nérer	pober	rader	sanfer
taver	tufer	vainrer	Vocater
Vouder	Zouter		

Learning sets

Two sets were used for the learning phase. Both used the principle of skewed input. One non-verb was displayed 8 times, and 4 other non-verbs two times each. The two sets used a different non-verb displayed 8 times. Each set contains 8 film clips and each clip was seen two times by the subjects.

Test sets

One set was used for the test phase. It contained twelve items, using twelve different film clips, six apparition film clips and six transitive film clips. Each test item contained two film clips, one with apparition, and one with transition. The sound described one of the film clip, either apparition or transitive. All items were balanced with respect to side (left or right) or sound (same number of items where the apparition was described or the transitive was described). Four different test sets were used to allow for all possible organisations (left vs. right for stimuli).

Example of Test film
Before and after apparition
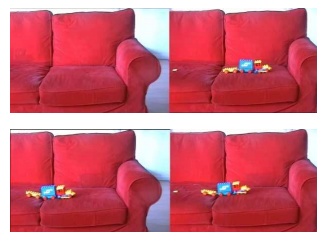
Results

No significant differences were found on training orders and on testing orders. Also, no preference was found for side designation (left vs. right).

An analysis was conducted to on the global children scores: how many did they choose the film clip that was described during the test? All results are presented in Table 2. The number of correct responses was 5.54 (SD 1.40) out of 12 possible correct responses. This results is significantly different from chance, $t(45)=-2.22$, $p=.03$. The children are below chance. Separate analysis for the apparition film clips only produced a non-significant result, $t(45)=-1.68$, $p=.10$. A non significant results was also found for transitive film clips, $t(45)=-0.94$, $p=.35$. Results were at chance level. More detailed analyses by children's age revealed only one significant result, children aged 3 performed worse than chance on the transitive condition, $t(23)=-2.46$, $p=.02$.

An ANOVA was conducted on the subjects' scores (dependent variable) including age as a between-subjects independent variable (3-year-olds vs. 4-year-olds) and the presenting condition (apparition vs. transitive) as within-subject independent variable. They was no effect of condition (apparition vs. transitive), $F(1,44)=0.427$, $p=.52$. They was also no effect of age, $F(1,44)=0.048$, $p=.82$. There was no interaction effect, $F(1,44)=3.612$, $p=.06$.

Table 2: Results for children categorised by age

	Number of children	Global scores	Scores for apparition sentences	Scores for transitive sentences
All children	46	5.54 (1.40)	2.70 (1.22)	2.85 (1.09)
3-year-olds	24	5.50 (1.38)	2.92 (1.02)	2.58 (0.83)
4-year-old	22	5.60 (1.44)	2.45 (1.40)	3.13 (1.28)

Discussion

The results did not confirm the prediction that children are able to learn to associate a new syntactic form with a new semantic function with only a few learning examples, contrary to what was demonstrated in Casenhiser and Goldberg (2005).

It does not seem that the absence of results comes from a fault in the experimental design, as there were similar results for apparition structures, which are new structures, and transitive structure, which the children are learning daily. The difference in results could be explained by the children age differences. English children were 5-7-year-olds whereas French children were only 3-4-year-olds. Older children may have a different type of knowledge available, especially more abstract knowledge. Also, during experimental session, there were many problems of attention with the younger children, which could explain some of their difficulties with the task.

Further work could be done with older children or using a more simple task to determine which was the problems with the current experiment.