Inducing the Production of Previously Inacceptable Syntactic Constructions

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Abstract

In a training experiment, a modest amount of repeated exposure to a syntactic construction ("long movement") that was initially inacceptable for the participants of the experiment led to a long-term positive effect on the probability of producing long wh-movement constructions. This positive training effect generalized to a different construction, and affected syntactic contexts in which the newly acquired construction competes with a well-established alternative constructions. Both aspects show that repeated exposure is able to change the linguistic system.

Inducing the Production of Previously Inacceptable Syntactic Constructions

Repeated exposure to the same syntactic construction has considerable effects on comprehension (e.g. Carminati et al., 2008; Kaschak, 2006; Kaschak & Glenberg, 2004; Pickering & Garrod, 2004) and production of sentences (e.g. Bock et al., 2007; van Gompel et al., 2006; Bock & Griffin, 2000; Pickering & Branigan, 1998) as well as on the perception of grammaticality (Nagata 1987). Psycholinguistic research has explained such effects in terms of short-term memory activation (Pickering & Branigan, 1998) and longer-term implicit learning (Bock & Griffin, 2000; Bock et al., 2007; Chang et al., 2000). In the first case, the effects arise from a transient activation of the primed constructions, which affects production and comprehension (Pickering & Branigan, 1998). In the second case, participants implicitly learn to process and produce the primed construction, leading to ease in comprehension and higher production rates (Bock & Griffin, 2000; Chang et al., 2000). The first aspect of priming has been linked to communicative functions such as alignment in dialogues (Pickering and Garrod, 2004) and the second has been argued to play a role in language acquisition (e.g. Savage, Lieven, Theakston & Tomasello, 2006; Chang et al., 2006).

Kaschak and Glenberg (2004; Kaschak, 2006) investigated how people adapt to constructions of an unfamiliar dialect. Participants were confronted with the "needs" construction (1b), a non-standard dialectal variant of (1a).

(1)   a. The meal needs to be cooked given that dinner is in an hour. (standard construction)

       b. The meal needs cooked given that dinner is in an hour. ("needs"-construction)

       c. The meal needs cooked vegetables to make it complete. (modifier construction)

Repeated exposure to the "needs"-construction led to less comprehension difficulties for speakers who did not have the construction in their dialect, as indicated by faster reading times at the word "given". This region disambiguates the unfamiliar construction from alternative modifier constructions such as (1c). This processing effect was generalized to different contexts in which the "needs" construction appeared, viz. to embedded sentences,

cleft constructions, and the verb "wants" (Kaschak, 2006). Kaschak (2006; Kaschak, 2007) explains his results in terms of implicit learning and proposes that learning to comprehend the unfamiliar constructions as well as language acquisition rely on underlying processes similar to syntactic priming (see Savage et al., 2006; Chang et al., 2006; Bock et al., 2007 for similar views).

Kaschak and colleagues demonstrated convincingly that repeated exposure eases processing. Nevertheless, two questions remain. First, the training and reading sessions were separated either by no time interval (Kaschak, 2006) or just a five-minute delay (Kaschak & Glenberg, 2004), leaving it open whether the observed effect on processing really stems from longer-lasting learning. Most likely, the connection between learning and training phase was also transparent to subjects. Second, the dependent variable was reading time with main effects reflected in slower reading times of the unfamiliar constructions for the control group. Much stronger evidence for learning a new grammatical structure would be evident if subjects were to actually produce the new structure.

The study reported here addresses these and further issues. First, it investigates whether exposure to unfamiliar and unacceptable constructions also enhances their production rates. By doing do, it allows us to decide whether effects of repeated exposure generalize from comprehension to production. Second, the interval between exposure and production was extended to several days in our experiment, so that we could determine if repeated exposure leads to a long lasting effect. In addition, the repeated exposure phase of the experiment was disguised in a subtle way as a text comprehension experiment. Third, the effect on production was not only measured for the construction used in the training phase of the experiment but also for a structurally related construction. Fourth, the material was constructed in such a way that it allows to assess the effects of repeated exposure both in contexts where the experimental construction is the only one structurally possible in the experimental context and in contexts in which the experimental constructions compete with

some other frequently used construction. This experimental design allowed us to decide if the effect of exposure reduces to the development of a "last resort" strategy in the absence of grammatical alternatives or involves a true extension of the grammatical system of the participants.

The present study builds on work reported in Fanselow, Kliegl, and Schlesewsky (2005). We look at the effects of repeated exposure to the so-called long distance wh-movement construction of German, as exemplified in (2) by its English counterpart. *Who* is the grammatical object of *see*, and should thus appear in the canonical position for objects to the immediate right of the verb *saw*. However, in constituent questions, expressions such as *who* appear at the left periphery of the matrix clause, they are 'moved' to that position. The label 'long distance' refers to the observation that an element from an embedded clause ends up in a position belonging to the matrix clause.

(2)   Who do you think that John saw (long distance wh-movement construction)

While long distance wh-movement is in use in dialects spoken in the South of Germany and in Austria, it is uncommon and considered unacceptable in the North-East of Germany (see Fanselow et al 2005, Fanselow & Weskott, submitted), in particular in the states of Berlin and Brandenburg, where we recruited our participants.

In the absence of long distance wh-movement, speakers in the North-East take recourse to other constructions also used in other German dialects, two of which figured in our experiment. The so-called copy construction (see Felser 2004) is characterized by the fact that the question wh-word appears at the left periphery of both the matrix and the embedded clause. An English counterpart would be (3a), a construction type not licit in adult English but representing a stage in early language acquisition (see Thornton & Crain 1993. In so-called partial movement construction (see McDaniel 1989) the "real" wh-word appears at the edge of the embedded clause while its semantic scope is indicated by placeholder *was/what* at the edge of the main clause, as shown in (3b). Again, this construction does not exist in adult

English but figures in language acquisition. All three constructions are confined to a colloquial use of language in German.

(3)   a. Who do you think who John saw? (copy construction).

       b. What do you think who John saw? (partial movement)

The production of long distance wh-movement constructions was measured by a sentence completion task presented to speakers of the Berlin/Brandenburg dialect both before and after a training phase. Production was also measured for long distance topicalization, in order to establish if the effect of repeated presentation was transferred to a related construction. German long distance topicalizations differ from their English counterpart (4) only in terms of subject-verb inversion in the main clause.

(4)   Mary, I believe that John likes

<div align="center">Method</div>

Participants

Thirty-six undergraduate psychology students of the University of Potsdam participated in the study. They received course credits or were paid for participation. The data of 19 participants in the training group and 17 participants in the control group were included in the analyses.

Design and procedure

A pretest-posttest control design consisting of a pretest, two training sessions, and a posttest, was used. The sessions were separated from each other by about 7 days, with the posttest sessions taking place around 21 days following pretest. All participants completed the same sentence completion task in the pretest and posttest sessions. Until they began with the posttest, they were unaware of the fact that they would have to complete the questionnaire of the pretest a second time.

The test material was presented using a paper-and-pencil method. Participants had to fill in blanks left in a text, an imaginary protocol of a secret conversation between a minister

and an environmental activist. Participants were asked to fill in one or more words into the blanks in the text in such a way that the completed text would make most sense in the current political constellation. There was no time restriction on completing the task. Eight of the blanks left in the text allowed the participant to produce long distance wh-movement constructions such as (2), four of the blanks allowed for a completion with a long distance topicalization such as (4).

In the training sessions, participants read thirty stories at their own pace on a computer screen and answered four comprehension questions for each of the stories. Three response alternatives were provided for each question to choose from. There were two groups of participants, a training and a control group who saw different versions of the comprehension questions. While the content of the questions did not differ between the groups, their type of construction did. The experimental group had to answer simple questions and questions involving long wh-movement (2). In the control group, the long distance questions were replaced by partial movement questions (3b) with the same content but a different syntactic structure.

Material for completion task

The completion task was constructed from a text of about 750 words by deleting one or more words and replacing them by blanks at 70 points in the text. Our text was an imaginary protocol of an overheard conversation between a minister and an activist of an environmentalist group. Participants were asked to fill in the blanks such that the resulting text would make most sense in the current political situation. There was no restriction on the number of words that could be used to complete the blanks.

Twelve of the blanks were critical items. Eight of the blanks were created in such a way that they allowed a completion resulting in a long distance wh-movement construction such as (2), (5) and (6). Of these eight items, four could also be completed as copy

constructions (3a, 6), the others (5) were designed such that they could only be completed by long wh-movement. Four of the twelve items could (only) be completed as long distance topicalizations such as (4, 7). The underlined passages were left blank to be filled in by the participants. The critical items are given in the appendix. The gaps for the critical items were arranged in such a way that critical items were separated by at least one filler gap (except for one item) and the different construction types being mixed.

(5) *Long question (Type I)*

       Auf welche Forderung glauben Sie **dass   ich** ohne weiteres eingehen kann?

       On   which demand   believe you that   I   in any event   respond   can

       "Which demand do you think I can accept without any problems?"

(6) *Long questions (Type II)*

       i) Wie meinen Sie denn, **dass wir das**   bezahlen sollen? (*dass-answer*)

         How think   you ptc. that   we that   pay   ought

       ii) Wie meinen Sie denn, **wie wir das**   bezahlen sollen? (*copy-answer*)

         How think   you ptc. how we that   pay   ought

        "How do you think we can pay for that?"

(7) *Long statements*

       Einen Neubau   von Verkehrsanbindungen   glaube ich nicht,

       A   new construction of   transport connections   believe I   not

       dass wir uns leisten   könnten.

       that   we   us   afford   can

       "I don't believe we can afford a new construction of transport connections."

An experiment with a preliminary version of this completion task had shown that speakers of the Berlin-Brandenburg variety of German rarely produced long distance wh-movement or long-distance topicalization when completing the questionnaire. Rather, they

used the copy construction where possible, inserted resumptive pronouns or other anaphoric devices rendering the sentences ungrammatical in the standard language, or failed to comply with the task by not filling in the blank or changing the syntax or the content of the text. By adding more content words then needed, they sometimes even managed to find loopholes allowing them not to use long movement. In the light of the fact that speakers of the Bavarian dialect have no difficulty in producing the intended completions of the blanks, we conclude that long movement has a very low acceptability for speakers of the Berlin-Brandenburg dialect. Given that they take recourse to the construction of ungrammatical strings, we even cannot tell whether their infrequent production of long movement was not an instance of completing the questionnaire with a sentence not considered acceptable because of the failure of finding a solution perceived as well-formed.

Training material

The same material was used in both training sessions. The training material consisted of 30 stories, each about six to eight sentences long. The stories followed a pattern used in theory-of-mind research, describing events and facts and the beliefs of the protagonists of the story concerning these events and facts. Each story was followed by four comprehension questions, two of them asking about such facts/events and the others asking about the protagonists' beliefs. Note that long movement wh-constructions are a particularly appropriate means for enquiring about the latter type of information.

The questions concerned with simple facts were syntactically non-complex main clause wh-questions, such as English *Who was responsible for the fire*? These questions were the same for the experimental and the control group. The two questions asking about the beliefs of the protagonists had the same content in both groups, but they came with a different syntactic structure. For the experimental group, these items were long distance wh-questions such as (8). The participants of the experimental thus were exposed to 30 (stories) x 2

(questions) x 2 (sessions) = 120 instances of long distance wh-movement constructions within roughly two weeks.

For the control group, the content of questions such as (8) was expressed as in (9), i.e. by the use of so-called partial movement. The construction has been analysed in very different ways in the linguistic literature, but only few such models would assume that it also involves long wh-movement in an interesting sense.

(8) Was   glaubte der Untersuchungsrichter **dass** für den Brand verantwortlich war?

What believed the examining magistrate that for the   fire   responsible   was

"What did the examining magistrate believe was responsible for the fire?"

(9) Was glaubte   der Untersuchungsrichter **wer** für den Brand verantwortlich war?

What believed the examining magistrate who for the fire   responsible   was

"Who did the examining magistrate believe was responsible for the fire?"

Data analysis

For inferential statistical analyses we applied a generalized linear mixed model (GLMM), using the lmer function of the lme4 package (Bates, Maechler, & Dai, 2009) provided in the R environment (R Development Core Team, 2009). This analysis corresponds to a logistic regression, taking into account correlations due to subjects and items.

Results

The responses of the participants to the critical items were coded into three types:

(a) *long movement responses*, i.e. the target answers illustrated in (5) and (7)

(b) *ungrammatical responses* which also include missing answers; and

(c) *alternative grammatical responses*, i.e., such as the copy construction (6ii) and other grammatical ways of filling in the blanks.

Table 1 gives the mean proportion (with standard deviation) of the three response types broken down by group, session and construction type. The focus of the first analysis were the long-movement responses.

Insert Table 1 about here

Figure 1 shows that training changed the probability of a long-movement response from pretest to posttest in the training group, but stayed at a similar level in the control group. A GLMM estimating fixed effects of Session, Group, and Construction Type and the variances associated with differences between Items and between Subjects for the probability of correct long-movement responses revealed a significant interaction between Session and Group (b: 1.13, SE: 0.25, z-score: 4.49, p< .0001).

Insert Figure 1 about here

None of the other effects approached the 5% level of significance (all p<.09). Thus, we do not have statistically reliable evidence that construction type affected the probability of long-movement responses. As shown in in Table 1, the probability of long movement responses in the training group increased for all three construction types. Follow-up analyses showed that the training and control group did not differ in the probability of long-movement constructions at pretest and at posttest and that the pretest-posttest change was significant only for the training group.

The previous analysis tested the training effect of the long-movement responses, collapsing ungrammatical and alternative grammatical responses. In a second GLMM, we tested whether there were any training-related effects on the probability of ungrammatical vs. alternative grammatical responses. As evident in Table 1, the probability of alternative responses was much higher for the long questions (Type II) (0.60) than for the long questions (Type I) (0.32) and long statements (0.38), while the probability of producing an ungrammatical response was much lower for the long questions (Type II) (0.04) than for the

other two constructions (long questions (Type I): 0.29, long statements: 0.23). This difference was significant (b=2.04, SE: 0.67, z-score: 3.04, p< .01) and independent of training-related factors (p >. 20).

<div align="center">Discussion</div>

The pretest results of both groups, and the posttest results of the control group, confirm that long distance movement is not a construction readily in use in the participants' dialect. Repeated exposure to long-movement constructions during training led to higher production rates of long movement constructions for all three construction types used in the experiment. The present study goes beyond previous research in that it demonstrates a training effect after several days. While this has been shown in priming studies with children (Savage et al., 2006), there were no comparable results for adults yet.

The increase in the production rate of long wh-movement constructions for items such as (5) lacking a grammatical alternative to long wh-movement is the most straightforward and least surprising of the results. Such training effects are expected in the light of Kaschak and colleagues' work, and our own. Still, it is remarkable that the training effect showed up even when training and test phases were separated by several days. The size of the time interval between exposure and production indicates that the training effect is not due to the temporal enhancement of acceptability that was observed in previous research (e.g., Luka & Barsalou, 2005; Snyder, 2000).

When training effects are observed in a domain in which there is no real expressive alternative to long distance movement, they may be interpreted as the adoption of a particular response strategy that would not necessarily imply anything for the participants' linguistic systems. Sprouse (2007) suggests that an increase in acceptability observed in rating experiments after repeated exposure might be explained along these lines. However, the robust training effects found in contexts in which long wh-movement competes with (and replaces after training) a grammatical alternative (copy construction) argues against such an

explanation of our results exclusively in terms of response strategies. In contrast to structures such as (5), items such as (6) come with no expressive problem and hence no difficulties for task compliance for the participants of the experiment. There is no need for applying a task-specific response strategy here. That repeated exposure to long wh-movement reduces the likelihood of producing a copy construction represents a direct impact of training on the participants' grammatical systems (but see below).

The transfer of the training effect from wh-movement to topicalization points into the same direction. While Kaschak and his colleagues showed that the trained construction is generalized from one verb to another, our results go beyond lexical extensions. Apparently, repeated exposure to long wh-movement boosts the acceptability of movement out of finite complement clauses quite in general. The type of movement (question formation vs. topicalization) does not really matter. Repeated exposure appears to have modulated the impact of a grammatical constraint regulating the scope of syntactic movement.

The most conservative interpretation of the training effects we have observed relates to the obvious differences between the perception and production grammar(s) of a specific language. We are able to parse and comprehend sentences from dialects different from out own, which shows that the grammar we apply in perception must be more flexible than the system that ultimately determines what we produce. Taking up a recent suggestion by Barbiers (2006) that proved useful for the syntactic description of dialects, we assume a division of labor between the grammar proper that specifies all constructions in use in different dialects, and a sociolinguisitc component determining which of these constructions are in fact actively used in a particular dialect. This view enables us to say that repeated exposure changed the 'sociolinguistic' but not the grammatical status proper of long movement constructions. Long movement constructions are within the grammatical scope of German, but their productivity is strongly restricted in Northern dialect. The transfer of the training effect from questions to topicalization suggests that what is at stake is a general

penalty for movement out of embedded finite clauses. Repeated exposure to such constructions reduces the impact of this filtering device in general. We note that this view is not incompatible with the implicit learning account used to explain syntactic priming (e.g., Chang et al., 2006; Savage et al., 2006; Kaschak, 2006).

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Appendix

a) Auf welche Forderung glauben Sie [dass ich] ohne   weiteres eingehen kann?

On   which demand   believe you   that I   in any event   respond can

"Which demand do you think I can accept without any problems?"

b) Wie   viele Leute glauben Sie denn dass sich in einem armen Bundesland

How many people believe you ptc. that   refl. in a   poor   (federal) state

wie   dem unserem überhaupt das Fliegen leisten können?

such as the ours   at all   the flying   afford   can

„How many people do you think can afford flying at all in a poor state such as ours?"

c) Mit   welchen Mitteln glauben Sie   denn, dass   wir Einfluss   auf diese

With which   means   believe you   ptc.   that we influence on   these

bedeutende   Wirtschaftsunternehmen bekommen können?

important   companies   get   can

„With which means/measures do you think we can get influence on these important

companies?"

d) Wie   viele   Arbeitsplätze denken Sie   denn   [dass die] Unternehmen bei uns

How many   new jobs   think   you   ptc.   that   the   companies   at us

schaffen würden?

made   would

„How many new jobs do you think would these companies add here/at our place?"

e) Einen Neubau   von Verkehrsanbindungen   glaube ich nicht,

A   new construction of transport connections   believe I   not

[dass wir]   uns leisten   könnten.

[that we] us   afford   can

"I don't believe we can afford a new construction of transport connections."

f) Auf so   ein Angebot denke ich [dass wir] eingehen müssen.

On such a   offer   think I   that we respond ought

"I think we ought to accept such an offer."

g) So   möchte ich nicht [dass unser] schönes Bundesland aussehen soll.

Such want I not that our nice state   look   ought

"I don't want that our nice state ought to look like that."

h) Einen Energieüberschuss denke ich nicht [dass uns] die Anlagen   bringen.

A   energy surplus   think I not that us the installations provide

"I don't think that the installations will provide us with an energy surplus."

i) Wie meinen Sie denn, dass [wir das]   bezahlen sollen?

How think you ptc. that we that   pay   ought

„How do you think we can pay for that?"

j) Wie meinen Sie denn [dass man] an Investitionen anders herankommen kann?

How mean you ptc. that one] on investments else reach   can

"How do you think we can obtain investments in an alternative way?"

k) Wie denken Sie denn [dass wir] ohne   Atomkraft   auskommen könnten?

How think you ptc. that we without nuclear energy do   could

"How do you think we could do without nuclear energy?"

l) Wer denken Sie   denn [dass Sie] sind?

Who think   you ptc.   that you are

"Who do you think you are?"

Acknowledgement

Table 1.

Mean proportion (SD) of responses broken down by group, session and construction type

|	Control		Training	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Long questions (Type I)				
Long-movement response	0.40 (0.49)	0.38 (0.49)	0.28 (0.45)	0.51 (0.50)
Ungrammatical response	0.29 (0.46)	0.28 (0.45)	0.41 (0.49)	0.18 (0.39)
Alternative response	0.31 (0.47)	0.34 (0.48)	0.32 (0.47)	0.30 (0.46)
Long questions (Type II)				
Long-movement response	0.41 (0.50)	0.34 (0.48)	0.29 (0.46)	0.38 (0.49)
Ungrammatical response	0.03 (0.17)	0.03 (0.17)	0.04 (0.20)	0.07 (0.25)
Alternative response	0.56 (0.50)	0.63 (0.49)	0.67 (0.47)	0.55 (0.50)
Long statements				
Long-movement response	0.44 (0.50)	0.40 (0.49)	0.30 (0.46)	0.45 (0.50)
Ungrammatical response	0.26 (0.44)	0.26 (0.44)	0.21 (0.41)	0.17 (0.38)
Alternative response	0.29 (0.46)	0.34 (0.48)	0.49 (0.50)	0.38 (0.49)
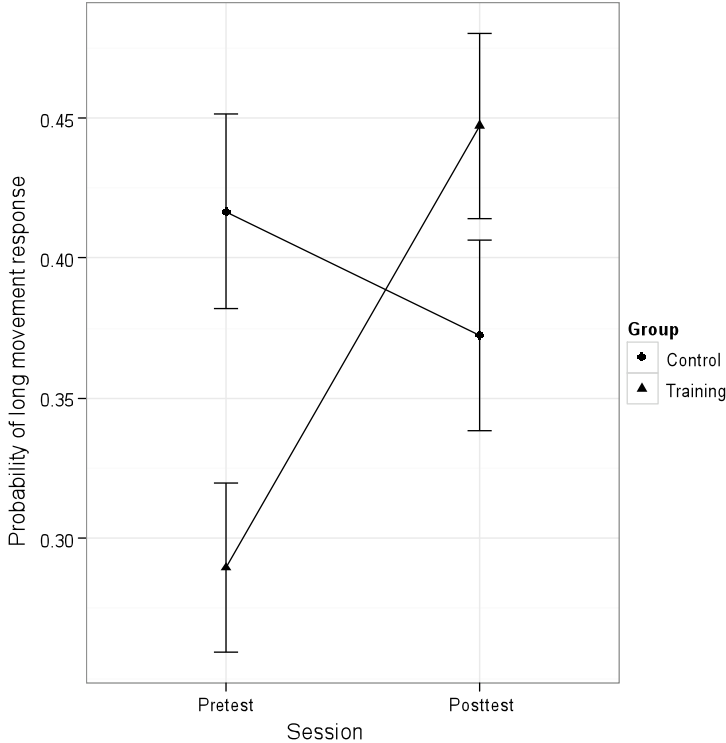
Figure 1: Mean probability (+/- 1 SE) of long movement responses as a function of Session and Group.