

Optionality in Verb Cluster Formation¹

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1 Introduction

In this paper we discuss a curious kind of optionality that is found with West-Germanic verb cluster formation. This kind of optionality differs from widely known cases of optionality like heavy NP shift in English or scrambling in German by the lack of any motivation, be it in terms of information structure or in terms of weight; all structural options can be used interchangeably without any difference in meaning. A well-known English example of this kind of optionality is quantifier-floating in English (e.g., Radford 1997). Another example is particle climbing in Dutch which is shown in (1) (see among others Bennis 1992; Evers 2003; Seuren 2003).

(1) Particle climbing in Dutch, taken from Seuren (2003)

- a. ..., *dat ze het boek [zou willen mogen **op**bergen]*
that she the book would like be-allowed put-away
- b. ..., *dat ze het boek [zou willen **op** mogen bergen]*
- c. ..., *dat ze het boek [zou **op** willen mogen bergen]*
- d. ..., *dat ze het boek [**op** zou willen mogen bergen]*

While the linear structure of the verbs in the cluster is rigid, a verbal particle like *op* may freely occur in any cluster-internal position preceding the lexical verb or, as Seuren (2003, page 274) puts it, verbal particles “(...) may climb through the V-cluster without limits (...)”

A less well-known but very similar kind of optionality is found in Colloquial German verb cluster formation. As with particle climbing in Dutch, an element, which in the German case is the finite auxiliary, is free to appear in several positions inside the verb cluster. We will concentrate on this case in the main part of our paper but come back to Dutch particle climbing in the final discussion where we will argue that we are dealing with a single kind of optionality here which is instantiated in different ways in Dutch and German.

In section 2 we give a short introduction to verb cluster formation in German. We will summarize experimental evidence on 3- and 4-verb clusters in

section 3, sum up an analysis given in Bader and Schmid (accepted) that accounts for this evidence in section 4, present new experimental findings on 5-verb clusters confirming and extending our data obtained so far in section 5 and finally summarize and point out some general implications of our work in section 6.

2 Verb cluster formation in German

As would be expected from an SOV language, verbs in German normally select their dependent elements to the left. This order is obligatory for DP objects as shown in (2) but it also occurs when a verb selects a verbal complement as shown in (3).

- (2) ..., *dass Peter [ein Buch ← schreibt]*
 that P. a book writes
 ‘that Peter writes a book’
- (3) a. ..., *dass Peter [ein Buch ← geschrieben ← hat]*
 that P. a Book written has
- b. ..., *dass Peter [ein Buch ← geschrieben ← haben ← könnte]*
 that P. a book written have could
- c. ..., *dass [ein Buch ← geschrieben ← worden ← sein ← könnte]*
 that a book written been be could

The standard order of verbs and their verbal complements thus adheres to the schema in (4).

- (4) $V_{\text{selected}} \leftarrow V_{\text{selecting}}$

There are, however, some well-known exceptions to this general picture in Standard German. When $V_{\text{selecting}}$ is represented by the perfect tense auxiliary *haben* and V_{selected} by a modal verb, then the perfect tense auxiliary has to be inverted to the front of the cluster, resulting in the order *Aux-(V...)-Mod* as shown in (5) for 3- and 4-verb clusters.

- (5) a. ..., *dass Peter ein Buch HAT → schreiben ← wollen*
 that P. a book has write want
- b. ..., *dass das Auto HAT → repariert ← werden ← müssen.*
 that the car has repaired be must

We will abstract away from a further peculiarity of this construction, namely that the modal verb has to appear in the bare infinitive instead of the selected past participle, the so-called ‘Infinitivus Pro Participio (IPP)’-effect, (see Schmid 2005 for an overview), and concentrate on verb order here. Furthermore, we will only discuss perfect tense clusters as in (5) (for future tense clusters, which are more liberal with respect to verb order even in Standard German, see Bader and Schmid accepted).

According to the authoritative prescriptive grammar of German, no other verb orders apart from order *Aux-(V...)-Mod* are allowed in cases like (5) (Duden-Grammatik [Fabricius-Hansen et al. (2005)], §684). However, we find a lot of variation across German dialects and varieties as shown in (6).

- (6) a. Variants of Austrian and Bavarian (Martina Wiltschko p.c.):
 ..., *dass er es schreiben **wollen** HAT*
 that he it write want has
- b. Pattern typical for Austrian and Bavarian (see Abraham 1995; Weiß 1998)
 ..., *dass er es schreiben HAT **wollen***
- c. Swiss German (see Lötscher 1978)
 ..., *dass er es HAT **wollen** schreiben*

Furthermore, there is often more than one possible order in dialects as shown in (7).

- (7) Sankt Gallen German (Schmid 2005)
- a. ..., *das I das immer HA mache **wöle***
 that I that always have make want
- b. ..., *das I das immer mache HA **wöle***
- c. ..., *das I das immer **wöle** mache HA*

The large amount of variation found for verb clusters including modal verbs as well as a small set of other semi-functional verbs like *lassen* (‘to let’) raises the question of whether native speakers of German indeed adhere to the strict Standard German pattern. In a series of experiments, Bader and Schmid (accepted) have found that this is not the case.

Native speakers of German are more liberal than prescriptive grammars (“Standard German”) in a precisely defined way: In addition to full inversion of the auxiliary as in the Standard German order *Aux-(V...)-Mod* they also allow partial inversion as in *(V...)-Aux-Mod*. We call the grammar that comprises these orders “Colloquial German”. This result raises further questions

about the correct generalization of German verb clusters as well as the correct syntactic account of the observed grammaticality distribution. We will look at these questions in more detail in the remainder of this paper.

3 Verb order variation in 3- and 4-verb clusters

Bader and Schmid (accepted) conducted a number of experiments investigating German verb clusters. For reasons of space we only summarize the basic experiment on 3-verb clusters and a follow-up experiment on 4-verb clusters.

Both experiments looked at verb clusters with modal verbs in the perfect tense by means of speeded grammaticality judgments (SGJ). In an SGJ experiment, participants judge sentences as either grammatical or ungrammatical under controlled and timed conditions. In the experiments reported here, sentences were presented word-by-word with a presentation rate of about 350ms per word. To ensure fast responses, participants had to give their grammaticality judgments within a deadline of 2000ms after the last word of the sentence was presented. Although there are alternative methods in order to obtain experimentally controlled grammaticality judgments, like rating sentences on a 5- or 6-point scale or magnitude estimation (cf. Cowart 1997; Featherston 2007), speeded grammaticality judgments have the advantage that they offer a spontaneous assessment of the grammatical status of the constructions in question. In addition, in all experiments reported here, experimental sentences were embedded in a large list of filler sentences with a ratio of experimental to filler sentences of about 1:5, which prevents participants from focusing on any particular kind of syntactic construction. Finally, Bader and Häussler (in prep.) conducted a direct comparison of speeded grammaticality judgments and magnitude estimation by letting participants judge the same sentences (including sentences containing 3-verb clusters of the sort considered here) with the help of both methods, and received very similar results.

In the 3-verb cluster experiment of Bader and Schmid (accepted), all six permutations that arise by manipulating the order of *Aux*, *V* and *Mod* were tested. The goal of this experiment was to determine the degree to which native speakers of German accept these six orders. The sentences differed in two dimensions: Order of the auxiliary (either in first, second, or third position), and order between lexical verb and modal verb (either $V < \text{Mod}$ or $\text{Mod} < V$). Both dimensions are shown schematically in Table 1.

Table 1: Dimensions of verb order variation

	Aux = 1	Aux = 2	Aux = 3
V < Mod	Aux-V-Mod	V-Aux-Mod	V-Mod-Aux
Mod < V	Aux-Mod-V	Mod-Aux-V	Mod-V-Aux

Five modal verbs were used in the experimental material: *können* (“can”), *müssen* (“must”), *wollen* (“want”), *dürfen* (“may”), *sollen* (“should”). Each modal verb appeared in six sentences and was always used in the bare infinitive.² A sample sentence is given in (8).

- (8) a. ..., *dass Peter ein Buch (HAT) lesen (HAT) **müssen** (HAT)*.
 that P. a book has read has must has
- b. ..., *dass Peter ein Buch (HAT) **müssen** (HAT) lesen (HAT)*.
 that P. a book has must has read has

If the experimental participants were adhering closely to Standard German, high percentages of judgments “grammatical” should be received for order *Aux-V-Mod* and low percentages for the remaining five orders. This expectation based on prescriptive grammar did not turn out to be correct.

The results of Experiment 1 from Bader and Schmid (accepted) are shown in Figure 1.

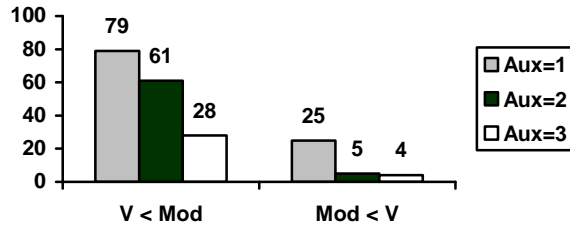


Figure 1: Percentages of judgments ‘grammatical’ in Experiment 1 of Bader and Schmid (accepted).

The Standard German order *Aux-V-Mod* received the best judgments (79% grammatical), but the partially inverted order *V-Aux-Mod* was also judged surprisingly good: with 61% grammatical much better than Standard Grammar would predict. The remaining orders, in contrast, obtained low grammaticality scores, as expected (ranging from 4-28%).

These results were confirmed by a series of follow-up experiments. On average, the Standard German order *Aux-V-Mod* was accepted 85% of the

time and the non-standard order *V-Aux-Mod* 70% of the time. Importantly, this finding was independent of the geographical background of the participants. This is the reason why Bader and Schmid (accepted) called the grammar allowing exactly these two orders *Colloquial German*.

In contrast to other claims in the literature (e.g., Sapp 2006; Schmid and Vogel 2004), they found no effect of extra-syntactic factors like focus on the acceptability of verb orders. They therefore assume “real” optionality of the orders *Aux-V-Mod* and *V-Aux-Mod* in the perfect tense of modal verbs.

To summarize so far, Colloquial German has been found to be more liberal than Standard German in allowing two verb orders in 3-verb clusters in which a modal verb occurs in the perfect tense. At the same time, Colloquial German is quite restrictive in that only these two orders (out of a set of six possible orders) are grammatical. On the basis of these data, one may arrive at the following generalization for Colloquial German verb clusters: First, the lexical verb has to precede the modal verb, and second, the auxiliary must obligatorily be inverted – either fully (i.e., to the first position) or partly.³ To test the validity of this generalization concerning auxiliary inversion in Colloquial German, Bader and Schmid (accepted) conducted a follow-up experiment on 4-verb clusters. The major results of this experiment will be briefly summarized in the following.

Bader and Schmid (accepted) looked at 4-verb clusters which were obtained from 3-verb clusters of the sort discussed above by passivizing the inner main verb. Thus, instead of a single main verb in the infinitive, the verbal complex contained the passive auxiliary *werden* (“to be”) and a past participle main verb in addition to the modal verb and the perfect auxiliary. A sample sentence is shown in (9).

(9) 4-verb clusters: ... *dass das Auto* ... (“that the car ...”)

- a. repariert *werden müssen* *HAT*
 repaired be must has
 “(...) had to be repaired”
- b. repariert *werden* *HAT [müssen]*
- c. repariert *HAT [werden müssen]*
- d. *HAT [repariert werden müssen]*

In the data presented here only the factor “placement of the auxiliary” (either first, second, third, or last position) varies whereas the position of the modal verb with respect to its complex complement is kept the same (modal after *V-Aux_{passive}*).⁴

In Standard German, the auxiliary must always be in first position, i.e., only order (9d) would be grammatical according to prescriptive grammar (Duden-Grammatik [Fabricius-Hansen et al (2005)], §684). The expectation for Colloquial German on the basis of Experiment 1 is quite different: All three orders in which the auxiliary is inverted, i.e., in which it appears either in first, second, or third position, should be accepted. As shown in Figure 2, this expectation was borne out.

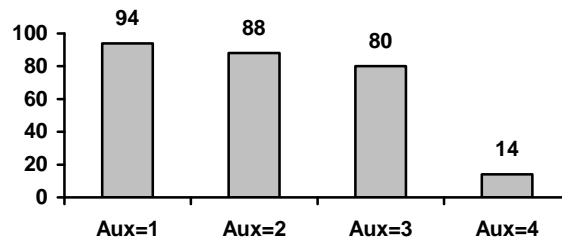


Figure 2: Percentages of judgments ‘grammatical’ in Experiment 4 of Bader and Schmid (accepted).

The Standard German order with the auxiliary in first position was judged best but the other two orders with inverted auxiliary (Aux = 2 and Aux = 3) reached a high level of judgments ‘grammatical’ as well (80-88%). Only the last verb order, in which the auxiliary was not inverted (Aux = 4), was judged ungrammatical.

The experimental evidence summarized so far has shown that Colloquial German verb clusters differ from verb clusters in Standard German. In Colloquial German, the perfective auxiliary may occur in any position to the left of the modal verb. This leads to two grammatical verb orders in 3-verb clusters and three grammatical orders in 4-verb clusters in contrast to only one licit order in Standard German. In other words, Colloquial German shows optionality of auxiliary placement here whereas Standard German does not.

Yet another difference between Standard and Colloquial German is found with 2-verb clusters consisting of modal verb and auxiliary. In contrast to English, German modal verbs may appear without an (overt) verbal complement as shown in (10).

- (10) a. ..., *dass er nach Paris **gewollt** HAT.*
 that he to Paris wanted has
 ‘..., that he wanted to go to Paris.’

- b. ..., *dass er nach Paris HAT wollen.* Colloquial German
 that he to Paris has want
 ‘...that he wanted to go to Paris.’

Semantically, sentences like (10) are understood as containing a motion verb. An analysis in which the syntactic structure of such sentences actually contains an empty verb ‘GO’ has been proposed by van Riemsdijk (2002); Bader and Schmid (submitted) discuss how van Riemsdijk’s proposal can be integrated into the analysis presented in the next section.

With respect to order, Standard German allows auxiliary inversion only in clusters of at least three verbs. Thus, (10b) with the auxiliary in front of the modal verb is excluded in Standard German. In Colloquial German, however, the order in (10b) is a grammatical option, too (see Bader and Schmid submitted). In summary, auxiliary inversion applies to verb clusters of any length in Colloquial German but is restricted to complex clusters (clusters with three or more verbs) in Standard German.

We summarize the observations on Colloquial German by the generalization in (11).⁵

(11) *Auxiliary inversion in Colloquial German*

An auxiliary selecting a modal verb inverts to any position in front of the modal verb, obligatorily in the perfect tense and optionally in the future tense.

We next present the analysis given in Bader and Schmid (accepted) for the data introduced so far before we test whether the generalization in (11) is valid for 5-verb clusters also.

4 Optionality in Auxiliary Placement: A Syntactic Proposal

Bader and Schmid (accepted) present a syntactic analysis which modifies and extends the verb cluster analysis proposed in Williams (2003).⁶ The four most important properties of this analysis may be summarized as follows: First, verb clusters are base generated and not derived by movement. Second, the analysis belongs to the family of analyses making use of *functional composition* (taken from Categorical Grammar, see Geach 1970 and subsequent work). Third, it places most of the information relevant for ordering into the lexicon, and last, optionality comes free in this approach.

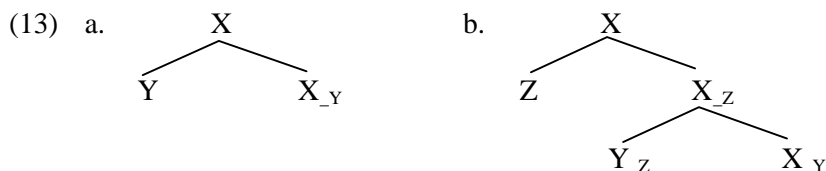
Williams (2003) defines the formal language CAT which is a restricted variant of Categorical Grammar. Central to CAT is the Rule of Combination which is shown in (12) (in a slightly different notation than in Williams 2003).

(12) *Rule of Combination* (Williams, 2003: 205)

$$X_Y + Y_Z \rightarrow [X+Y]_X_Z$$

This rule is to be read as follows: “ X_Y ” is a syntactic unit of category X which subcategorizes for a syntactic unit of category Y . “ Y_Z ” is accordingly a syntactic unit of category Y which subcategorizes for a syntactic unit of category Z . Since “ X_Y ” selects “ Y_Z ”, application of the Rule of Combination results in a unit which is of category X and subcategorizes for Z .

The application of the Rule of Combination is schematically illustrated in (13). The tree in (13a) shows the structure that results if the subcategorization feature of Y is empty (functional application), and the structure shown in (13b) if the subcategorization feature is not empty but category Z (functional composition).



The Rule of Combination applies to lexical elements which are associated with the three types of subcategorization information shown in (14).

- (14) a. Type of complement: N vs. V vs. ...
 b. Order of selection: left vs. right
 c. Level of complement: X^0 vs. X^N

The grammar of a particular language is obtained by specifying this subcategorization information. Sample lexical specifications for German main verbs, modals and auxiliaries are given in (15). The direction of selection is specified by arrows.

(15) Sample lexical entries for verbs in German

- a. Main verbs – $V_{Main}: DP \leftarrow$; $V_{Main}: PP \leftarrow$; $V_{Main}: DP PP \leftarrow$; ...
 b. Modal and auxiliary verbs – $V_{Mod/Aux}: V \leftarrow$

The subcategorization frames shown in (15) all have in common that the direction of selection is uniformly to the left whereas the category of the selected element differs (DP and PP with main verbs, and V with modal and auxiliary verbs).

As discussed above (see (10)), auxiliary inversion in Standard German applies only to complex clusters whereas it applies across the board in Colloquial German. This is a kind of variation which cannot be captured by the subcategorization information given in (15). Bader and Schmid (accepted) therefore make use of an additional complexity feature for verb clusters (adopted from Williams, 2003:184). This feature is shown in (16).

(16) Subcategorization feature for verb clusters: The *complexity* feature

- a. Verb cluster: [VV-max]
- b. Simple verb: [V°]

‘VV-max’ is to be understood as the maximal verb cluster selected by the verb at hand. This is the value of the complexity feature that we use to account for Standard German. It must combine two restrictions. First, inversion of the finite auxiliary occurs only in clusters of length three or greater. The feature ‘VV-max’ therefore requires a verb cluster as complement of the auxiliary, that is, a combination of at least two verbs (‘VV’). Second, the auxiliary must invert to the cluster-initial position. This requirement is achieved by the maximality part of ‘VV-max’. The auxiliary must be combined with a maximal verb cluster. In terms of the Rule of Combination, a maximal verb cluster is one in which all subcategorization requirements for verbs have already been saturated. In contrast to the first value of the complexity feature, the second one is quite simple. ‘V°’ requires that the auxiliary combines with a lexical head in the sense of X-bar theory.

The possibility of having complexity requirements as in (16) in the subcategorization frames of lexical items leads to three different systems of 3-verb clusters if only the complexity requirement is varied and order, type, and level specifications are kept the same. These three systems are shown in Table 2.

Table 2: Complexity Variations

V-orders	System 1: → Mod _[VV-max]	System 2: → Mod _[V°]	System 3: → Mod
Aux-V-Mod	√	—	√
V-Aux-Mod	—	√	√

In System 1, in which a complex modal is selected to the right, only full inversion of the auxiliary is grammatical. This is what we find in Standard German. In System 2, the auxiliary selects a simple modal verb to the right, which results in partial inversion of the auxiliary only. This is the system of

3-verb clusters that has been described by Louden (1990) for Pennsylvania German. In System 3, finally, the complexity feature is dropped completely. As a consequence, auxiliary inversion is independent of complexity. This is exactly what we find in Colloquial German according to our experimental evidence.

The Standard German subcategorization frames for the perfect tense auxiliary *haben* may now be specified as in (17). Modal verbs are selected to the right and are subject to the complexity restriction described above. This ensures that auxiliary inversion only applies in verb clusters with at least three verbs, bringing the auxiliary always to the front of the cluster. All other verbs are selected to the left.

(17) Subcategorization frame for Standard German *haben* – V_{Aux} :

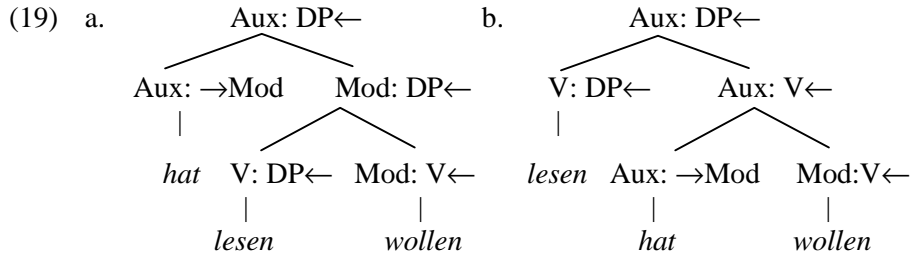
- a. $\rightarrow Mod_{[VV-max]}$ b. $V \leftarrow$

The subcategorization frames for Colloquial German perfective *haben* are shown in (18). Modal verbs are again selected to the right, but this time independently of their complexity whereas all other verbs are selected to the left, as in Standard German.

(18) Subcategorization frame for Colloquial German *haben* – V_{Aux} :

- a. $\rightarrow Mod$ b. $V \leftarrow$

Applying the Rule of Combination to the subcategorization information in (17a) and (18a) derives the two trees for 3-verb clusters that are shown in (19).



For Standard German, only tree (19a) can be derived because the complexity requirement of the perfect auxiliary is only fulfilled in this tree. When the complexity feature is dropped, as in (18a), both trees can be derived, and thus exactly the two verb orders that appear in Colloquial German according to our experimental evidence.

Optionality of verb order in Colloquial German therefore follows from the lack of an idiosyncratic complexity feature in the lexical entry of perfective *haben*. The verb cluster generalization given in (11) – auxiliary inversion is obligatory while the scope of inversion is underspecified – finds an adequate expression in the CAT-based approach. The variation between Standard and Colloquial German verb clusters involving modal verbs thus reduce to a small lexical difference – absence versus presence of the complexity requirement within the subcategorization frames of auxiliaries.

5 Experimental evidence from 5-verb clusters

In our work so far, we have investigated verb clusters ranging from two to four verbs. Here we report an additional experiment in which we investigated 5-verb clusters by the method of speeded grammaticality judgments. If the generalization is correct that modal-verb clusters in Colloquial German require the finite auxiliary to precede the modal verb but are otherwise unspecified with respect to the auxiliary’s position, four versions of (20) should be accepted while only the version with the auxiliary in cluster-final position should be rejected. Note that the numbers in (20) refer to selection relations.

(20) (Aux1) V5 (Aux1) V4 (Aux1) V3 (Aux1) Mod2 (*Aux1)

The 5-verb clusters were derived from the 4-verb clusters that formed the basis of the 4-verb cluster experiment in the preceding section in the following way. A sample sentence with a 4-verb cluster is repeated in (21).

(21) 4-verb clusters: Perf > Mod > [Pass > V]
 ... dass das Auto ...*HAT* [repariert werden *müssen*]
 that the car has repaired be must
 ‘... that the car has had to be repaired.’

As indicated in (21), the inner layer of the 4-verb cluster contained a main verb in the passive voice, that is, a main verb plus a passive auxiliary (‘to be repaired’). To obtain a 5-verb cluster, the passivized main verb was put into the perfect tense by inserting an additional perfect tense auxiliary (‘to have been repaired’). The resulting sentence is shown in (22).

(22) 5-verb clusters: Perf > Mod > **Perf** > Pass > V
 ... dass das Auto ...*HÄTTE* [repariert worden sein *müssen*]
 that the car had repaired been be must
 ‘... that the car should have been repaired.’

Intuitively, sentences as in (22) are somewhat complex but still fully comprehensible. Note in particular that the sentences under consideration differ in important respects from the sentences that were the topic of the seminal verb cluster study by Bach, Brown and Marslen-Wilson (1986). An example sentence with five verbs from Bach et al. is shown in (23).

- (23) [Ingrid]₁ hat1 [Lotte]₂ [die Bewohner]₃ [dem Blinden]₄ [das Essen]₅
 I. has L. the residents the blind person the food
*kochen*₅ *helfen*₄ *lehren*₃ *hören*₂.
 cook help teach hear
 ‘Ingrid has heard how Lotte taught the residents to help the blind
 person cook the food.’

Sentences like (23) were shown to be basically incomprehensible, a finding which confirms the intuition one has when reading such sentences. Note, however, that in (23) NP arguments are not only introduced by the most deeply embedded main verb but by all other verbs too except the finite auxiliary. The sentence therefore contains four NP arguments in addition to its five verbs. Furthermore, sentence (23) contains several instances of shared semantic arguments; for example, the NP *dem Blinden* (‘the blind person’) is both the agent argument of *kochen* (‘to cook’) and the beneficiary argument of *helfen* (‘to help’) from which it also gets its case.

Neither of these complications is present in the sentences of the current experiment. NP arguments are only introduced by the most deeply embedded main verb, and argument sharing is accordingly not involved. In fact, due to the effect of passivization, the sentences of the current experiment contain just a single NP argument in addition to the verb cluster.

5.1 Method

Participants. 20 students of the University of Konstanz participated in the current experiment. Participants were either paid or they received course credits. All participants were native speakers of German and naive with respect to the purpose of the experiment.

Materials. 20 sentences were created with each sentence appearing in five versions according to the five positions that the finite auxiliary can occupy in a 5-verb cluster. An original experimental sentence is shown in (24). The five possible positions of the auxiliary, which would be *hätte* (‘had’) in (24), are indicated by the five numbered bullets. The bullet numbered 1 is the position required in Standard German.

- (24) *Ich weiß, dass das Dokument im Laufe des Tages*
 I know that the document in-the course of-the day
•₁ vernichtet •₂ worden •₃ sein •₄ sollen •₅.
 destroyed been-PASS be-PERF shall
 ‘I know that the document should have been destroyed in the course of
 the day.’

As shown in (24), all sentences consisted of a main clause followed by an embedded clause introduced by the complementizer *dass* (‘that’). The 5-verb cluster under investigation was always part of the embedded clause. Two modal verbs were used in ten sentences each: *müssen* (‘must’) and *sollen* (‘shall’).

From the total set of 20 sentences, four lists were created. Each list contained an equal number of sentences in each condition but no more than one version of any sentence appeared in a list. Each participant saw only a single list of experimental sentences. The order of presentation was randomized for each participant individually. The experimental sentences were embedded in a list of 110 filler sentences. The filler sentences represented a wide variety of grammatical and ungrammatical sentences and were partly taken from unrelated experiments.

Procedure. Sentences were presented visually using the DMDX software developed by K. Forster and J. Forster at Monash University and the University of Arizona. Participants were seated in front of a computer monitor. They were told that they would be presented sentences on the screen and that their task was to judge the grammaticality of each sentence as quickly and as accurately as possible. The concept of grammaticality was explained by examples. Participants initiated each trial by pressing the space-bar which triggered three fixation points to appear in the center of the screen for 1050 milliseconds. Thereafter, the sentence appeared on the screen in a word by word fashion with each word appearing at the same position (mid-screen). Each word was presented for 225msec plus additional 25msec for each character to compensate for length effects. There was no interval between words. Immediately after the last word of a sentence, three red question marks appeared on the screen, signaling to participants that they now were to make their judgment. Participants indicated their judgment by pressing either the left or the right shift key on a computer keyboard. They used their right hand to indicate that a sentence was grammatical and their left hand to indicate that it was ungrammatical. If participants did not respond within 2000 milli-

seconds, a red warning “zu langsam” (‘too slow’) appeared on the screen and the trial was finished automatically.

Prior to the experimental session, participants received practice trials to ensure that they had understood the task. During the practice trials but not during the experimental session participants received feedback as to the correctness of their judgments.

5.2 Results

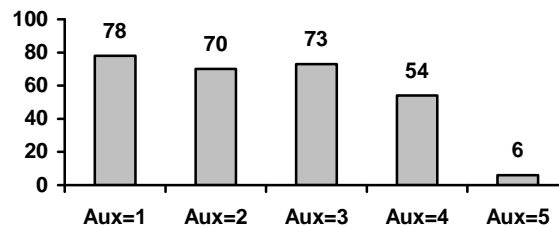


Figure 3: Percentages of judgments ‘grammatical’ for the five positions of the finite auxiliary that were tested in the current experiment

Figure 3 shows the percentages of responses ‘grammatical’ for the five auxiliary positions that were tested in the current experiment. One-way analyses of variance (ANOVAs) with either participants (F1) or items (F2) as random factor revealed a highly significant effect of the factor Auxiliary Position ($F1(4,76)=34.30$, $p < .001$; $F2(4,76)= 22.72$, $p < .001$). Subsequent planned comparison showed that the first three auxiliary positions did not differ from each other (all t -values < 1), but the fourth position differed significantly from the mean of the first three (54% versus 73%; $t_1 = 5.18$, $p < .01$; $t_2 = 2.77$, $p < .01$). The fifth position finally differed significantly from the fourth position (54% versus 6 %; $t_1 = 6.74$, $p < .001$; $t_2 = 5.48$, $p < .001$).

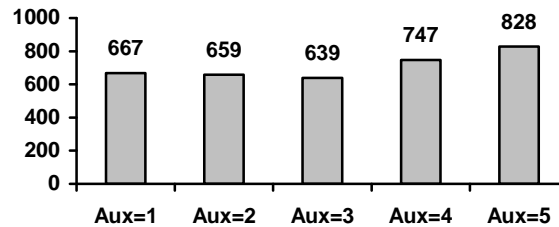


Figure 4: Mean reaction times in ms for judgments ‘grammatical’ for the five positions of the finite auxiliary that were tested in the current experiment

Mean reaction times for judgments ‘grammatical’ are shown in Figure 4. We do not present statistical analyses for reaction times because there would have been too many empty cells in the analysis. Numerically, the reaction time pattern is the inverse of the pattern of percentages of judgments ‘grammatical’. The first three positions receive the fastest reaction times; reaction times for the fourth position are about 90ms slower, and reaction times for the fifth position are slower by additional 90ms.

5.3 Discussion

The results of the current experiment provide a striking confirmation of the verb cluster generalization that we derived from our prior experiments with verb clusters containing two, three, or four verbs: For 5-verb clusters of the sort considered here, we see a clear distinction between the positions in which the auxiliary precedes the modal verb and the single position in which the auxiliary follows the modal verb. The first three auxiliary positions preceding the modal verb were accepted to a substantial degree. Judgments for the fourth position were significantly lower but still received a value above 50%. However, when the auxiliary verb followed the modal verb, the acceptance rate dropped sharply to a value only slightly above 0%.

The fact that no condition reached more than 78% judgments ‘grammatical’ can plausibly be attributed to the inherent complexity associated with a verb cluster containing 5-verbs. Although our results clearly argue that the sentences under consideration could be successfully processed – in contrast to the 5-verb sentences of Bach et al. (1986), as discussed above – it is nevertheless true that even the 5-verb clusters of the current experiment are complex. This is not only true in syntactic terms but also in semantic terms.

Although four of the five verbs are function verbs which do not introduce thematic roles of their own – which makes the cluster much easier to process than the clusters investigated by Bach et al. (1986) – the high degree of stacking nevertheless seems to complicate the interpretation of the cluster. Crucially, even the cluster internal order that is considered to be grammatical in Standard German – the cluster with the auxiliary inverted to the front of the cluster – showed a somewhat reduced acceptability. In fact, the first three auxiliary positions received grammaticality values which were statistically not distinguishable from each other. The fourth auxiliary position was judged significantly worse than the first three but still much better than the fifth position in which the auxiliary follows the modal verb. While we do not have an explanation for the reduced acceptability of the fourth position, we can at least note that something similar has been reported for the Dutch verb-particle construction that was mentioned in the introduction. While all particle positions in front of the main verb are considered grammatical, some seem to be preferred over others in stylistic terms (see Evers 2003).

6 General Discussion

We have presented an experiment on auxiliary inversion in German 5-verb clusters. Extending earlier results on 2, 3- and 4-verb clusters, the results of the current experiment show that the rules of prescriptive grammar – according to which only verb clusters with fully inverted auxiliary are grammatical – are at odds with the grammar of verb cluster formation internalized by native speakers of German: As in Standard German, auxiliary inversion is obligatory for native speakers, but in contrast to Standard German, the scope of inversion is free. We therefore get optionality in our experimental data which we take to represent Colloquial German.

Since Standard German lacks this kind of optionality, the set of grammatical verb clusters is much smaller in Standard German than in Colloquial German. Standard German allows exactly one order for each cluster size whereas Colloquial German allows $n-1$ orders for each cluster of size n . For clusters of size 3-5, we thus get 3 grammatical variants for Standard German but 9 grammatical variants for Colloquial German. All orders which are grammatical in Standard German are also grammatical in Colloquial German, making Standard German a subset of Colloquial German.

While Standard and Colloquial German thus exhibit substantial differences in terms of surface strings, the underlying grammatical difference is only minimal according to the syntactic analysis presented here. Standard German imposes a complexity requirement on auxiliary inversion but Collo-

quial German does not. Given the apparently idiosyncratic nature of the complexity feature, the lack of such a feature in Colloquial German implies that the grammar of Colloquial German is less complex than the grammar of Standard German. This is a welcome result because Colloquial German represents native speakers' spontaneous grammaticality judgments. It therefore seems reasonable to assume that Colloquial German reflects a more natural grammar than Standard German which might be an artificial product of prescriptive pressure.

We are thus led to the hypothesis that the optionality found with auxiliary inversion in Colloquial German is something which follows without further stipulations from the correct syntactic analysis. Further evidence for this hypothesis comes from other cases of optionality found in the syntax of verb cluster formation. Chief among them is the phenomenon of Dutch particle climbing which was briefly mentioned in the introduction. The relevant data from example (1) are repeated in a schematic form in (25).

- (25) ... [*op* zou *op* willen *op* mogen *op*bergen **op*]
 would like be-allowed put away

On first sight, Dutch particle climbing and Colloquial German auxiliary inversion seem to be two quite different things. In particular, the 'moveable' element in Dutch, the particle, is a selected element which takes the lowest position in the selectional hierarchy of the verb cluster. In Colloquial German, in contrast, the 'moveable' element is a finite auxiliary which is the highest selecting element within the cluster. This difference notwithstanding, we will argue now that the two constructions share a range of properties which makes it possible to derive them by the same formal means.

First of all, in both cases there is a predominant direction of selection in the verb cluster domain. Typically, the direction of selection is to the right in Dutch but to the left in German, leading to a rigid left-to-right (Dutch) or right-to-left (German) linear order of the elements in the verbal cluster.⁷ At the same time, however, a verb cluster may contain an element with exactly the opposite selectional requirement from the other cluster elements. In Dutch, this element is the main verb itself which selects non-verbal complements to the left and thus in the opposite direction from the other verbs of the verb cluster; in German, an auxiliary selecting a modal verb is associated with a reversed direction of selection. What we thus get is a verb cluster with inconsistent direction of selection, as shown schematically for Dutch in (26a) and for German in (26b).

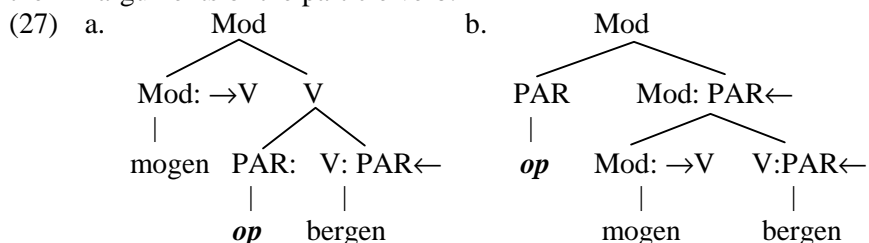
(26) Inconsistent direction of selection:

- a. Dutch: $V1 \rightarrow V2 \rightarrow [PAR4 \leftarrow V3]$
 b. German: $AUX1 \rightarrow [V4 \leftarrow V3 \leftarrow V2]$

Configurations as in (26) give rise to verb-cluster internal optionality. Either the highest or the lowest element in the chain of selection may freely appear in any position inside the verbal cluster as long as it does not violate the direction of selection. In Dutch, this is the lowest element, namely the verb particle; in German, it is the finite auxiliary, the highest element. This difference between German and Dutch is a consequence of the fact that Dutch verb clusters are right-oriented whereas German verb clusters are left-oriented.

In the CAT-based analysis that we have presented above, the optionality that arises in (26a) and (26b) follows without further stipulation from the fact that the Rule of Combination allows the transmission of subcategorization information (functional composition). As has already been shown in (19) for German verb clusters, this makes it possible to insert the auxiliary in any position in front of the modal verb. In fact, a complex feature specification ‘VV-max’ was necessary to prevent the auxiliary from appearing in any position except the cluster-initial one.

Two illustrative syntactic trees for Dutch are shown in (27). For ease of exposition, we have omitted the subcategorization information pertaining to the DP arguments of the particle verb.



In (27a), the particle *op* combines immediately with the main verb by which it is subcategorized. In (27b), the main verb first combines with the modal verb *mogen*; the subcategorization feature ‘PAR←’ is inherited by the resulting syntactic node, and the particle combines with this node. Deriving the further positions of *op* in (25) works in a similar way.

Note finally, that for the kind of optionality that we have discussed above, mixed direction of selection is a prerequisite. If the direction of selection is consistent either to the right, as in a head-initial language like English (cf. (28a)), or to the left, as in a head-final language like Japanese (cf. (28b)),

each element must appear exactly at the position in the syntactic tree which corresponds to its position in the chain of selection.

(28) Consistent direction of selection:

a. English: $V1 \rightarrow V2 \rightarrow V3 \rightarrow [V4 \rightarrow \alpha]$

a. Japanese: $[\alpha \leftarrow V4] \leftarrow V3 \leftarrow V2 \leftarrow V1$

As a concluding remark, let us consider the issue of optionality in verb cluster formation from the perspective of language acquisition. As is well-known from the pertinent literature (e.g., Guasti 2002), children acquire the basic word-order regularities of their native language quite early on. A child learning German or Dutch will therefore detect the basic OV nature of these languages at an early stage.

During this stage the child assumes that verbs always select their complements to the left. When acquiring German, the child will also realize soon that verbs selected by other verbs adhere to the OV nature of German too, making ‘selected verb before selecting verb’ the order normally obeyed by verb clusters. At some later point, the child will come to realize that there exists one exception with respect to the direction of selection in the verbal cluster: auxiliary verbs may select modal verbs to the right. As soon as the child detects such a case of selection in the “wrong” direction, a slight revision of the child’s initial assumption about the general OV nature of German is necessary. The child will postulate a lexical entry specifying that auxiliaries select modal verbs to the right. In the absence of negative evidence to the contrary, the child will then be led to the further conclusion that the auxiliary may appear in every position inside the cluster as long as it selects its modal verb complement to the right. What the child will thus have acquired is the grammatical system of Colloquial German as described above.

Of course, this is not the system of Standard German because Standard German requires the additional feature VV-max. According to the analysis pursued in this paper, Standard German imposes an artificial restriction on the scope of auxiliary inversion, a restriction which can only be acquired by negative evidence. We were not able to find relevant information on this point in the acquisition literature. An ongoing corpus study revealed that in German newspapers verb clusters occur almost exclusively with the Standard German order, that is, with full inversion of the auxiliary. However, in a systematic web search we found that clusters with partial inversion of the auxiliary also occur with some regularity whereas clusters with no inversion at all are basically non-existent. Two illustrative examples containing a 4-

verb cluster with the same main verb are given in (29). The finite auxiliary shows up in second position in (29a) and in third position in (29b).

- (29) a. *Udo machte deutlich, dass ohne Frank dieses Festival*
 U. made clear that without F. this festival
nicht in die Realität umgesetzt hätte werden können. ...
 not into the reality put had been can
 ‘Udo made clear that this festival could not have been realized without Frank.’
 (Downloaded on 1.1.2008 - www.genesis-fanclub.de/archiv/petergabriel/interviews/koenixxtreffen.htm)
- b. *Schröder wäre es bestimmt auch recht gewesen,*
 S. were it surely also right been
wenn es 1:1 umgesetzt werden hätte können.
 if it put been had can
 ‘It would surely have been okay for Schröder if it could have been realized 1:1.’
 (Downloaded on 1.1.2008 - www.stern.de/forum/showflat.php?Cat=0&Board=politikdeutschland&Number=1346410&page=3)

If the difference between language as used in newspapers and language as used in the internet can be corroborated, it suggests that we get optionality with respect to auxiliary inversion mainly with less formal registers. This in turn suggests to us that the lack of optionality in Standard German is indeed a matter of prescriptive influence, and that a grammar allowing the peculiar kind of optionality that is found in verb-cluster formation must be less complex than a grammar disallowing it.

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² Bader and Schmid (accepted) conducted a further experiment in which the past participle of modals was compared to the bare infinitive in 3-verb clusters. This experiment confirmed the obligatoriness of the bare infinitive (IPP).

³ Bader and Schmid (accepted) transform their experimental results (% grammatical) into binary distinctions (assuming that the dividing line between grammatical and ungrammatical sentences is 50%). Since we are still not yet in a position to account for the gradience in the data we will follow this practice here.

⁴ This experiment contained a second factor „position of modal verb“. The modal verb either followed the passivized verb, as in the examples considered here, or preceded it. For reasons of space, we omit the latter condition here.

⁵ Although we could not discuss the data concerning future tense verb clusters in the current paper, we have included the future tense in the generalization (11) for reasons of completeness.

⁶ For reasons of space, we can discuss neither similar nor dissimilar syntactic accounts of verb cluster formation. For comprehensive discussion and relevant references, see Bader and Schmid (accepted).

⁷ For Dutch, this is a simplification because Dutch exhibits a much greater degree of optionality than we can describe here; see, e.g., Koopman and Szabolcsi (2000), Wurmbrand (2006), and references cited there.