Optionality in Verb-Cluster Formation

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In German, verbs normally select their dependent elements to the left. This is true for objects . . .

(1) . . . dass Peter [ein Buch ← schreibt].
    that P. a book writes

. . . and also for verbs selected by another verb.

(2) a. . . dass er [es ← geschrieben ← hat].
    that he it written has

   b. . . dass er [es ← geschrieben ← haben ← könnte].
    that he it written have could
   ‘. . . that he might have written it.’

   c. . . dass [es ← geschrieben ← worden ← sein ← könnte].
    that it written been be could
   ‘. . . that it might have been written.’
The general pattern thus looks as in (3):

(3)  
   a. \( V_2 \leftarrow V_1 \)  
   b. \( V_3 \leftarrow V_2 \leftarrow V_1 \)  
   c. \( V_4 \leftarrow V_3 \leftarrow V_2 \leftarrow V_1 \)  

There are certain well-known exceptions to (3):
For \( V_1 = \text{Aux}_{\text{perfective}} \) and \( V_2 = \text{Modal} \), the auxiliary must be fronted to the cluster initial position according to normative grammars of Standard German:

(4) \( \text{Aux}_1 \rightarrow V_3 \leftarrow \text{Mod}_2 \)

\[ \text{dass er es [hat \rightarrow [schreiben \leftarrow wollen]].} \]
However . . .

. . . we find a lot of variation across German dialects and varieties:

(5)  
   a. Certain variants of Austrian and Bavarian:
       dass er es [[schreiben ← wollen] ← hat].  \[V-Mod-Aux\]
   
   b. Pattern typical for Austrian and Bavarian:
       dass er es [schreiben ← [hat → wollen]]. \[V-Aux-Mod\]
   
   c. Standard German:
       dass er es [hat → [schreiben ← wollen]]. \[Aux-V-Mod\]

(6)  
   Swiss German:
       dass er es [hat → [wollen → schreiben]]. \[Aux-Mod-V\]

Furthermore, it is reported that dialects often allow for more than one order.
The large amount of variation found for verb clusters including modal verbs (and a couple of other ‘semi-functional’ verbs) raises the following question:

- Do speakers of German adhere to the strict Standard German pattern?

In a series of experimental investigations of verb cluster formation, we have found that they do not:

- Native speakers (‘Colloquial German’) are more liberal than prescriptive grammars (‘Standard German’) in a precisely defined way.
Questions Adressed in our Work

This in turn raises a bunch of new questions:

- What is the correct generalization about the linearization of German verb clusters?
- What is the best syntactic account of the observed grammaticality distribution?
- Is the observed optionality a matter of grammar or performance?

In this talk, we . . .

- . . . present new experimental findings confirming and extending our data obtained so far.
- . . . summarize the syntactic analysis presented in Bader & Schmid (submitted).
- . . . point out some general implications of our work.
Outline

1. Experiment 1: 3-verb clusters
2. A Note on Focus and Order
3. Syntactic Analysis
4. Experiments 2 and 3: 4 and 5-verb clusters
5. Summary and Discussion
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Experiment 1: Introduction

Topics of Experiment 1:

- Order among verbs within 3-verb clusters
- Comparison of two different methods to assess the grammaticality of sentences

Experiment 1 replicates a prior experiment using two experimental procedures in a single session:

- **Speeded Grammaticality Judgments (SGJ):** Participants judge sentences as either grammatical or ungrammatical under controlled and timed conditions.

- **Magnitude Estimation (ME):** Participants evaluate sentences relative to a reference sentence on a continuous scale.
## Experiment 1: 3-verb clusters

### Introduction

<table>
<thead>
<tr>
<th></th>
<th>Aux = 1</th>
<th>Aux = 2</th>
<th>Aux = 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V \prec Mod$</td>
<td>Aux-V-Mod</td>
<td>V-Aux-Mod</td>
<td>V-Mod-Aux</td>
</tr>
<tr>
<td>$Mod \prec V$</td>
<td>Aux-Mod-V</td>
<td>Mod-Aux-V</td>
<td>Mod-V-Aux</td>
</tr>
</tbody>
</table>

(7) dass Peter ein Buch (HAT) *lesen* (HAT) *müssen* (HAT).

that P. a book has read has must has

(8) dass Peter ein Buch (HAT) *müssen* (HAT) *lesen* (HAT).

that P. a book has read has must has
### Experiment 1: Expectation

<table>
<thead>
<tr>
<th></th>
<th>$Aux = 1$</th>
<th>$Aux = 2$</th>
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</tr>
</thead>
<tbody>
<tr>
<td>$V &lt; Mod$</td>
<td>Aux-V-Mod</td>
<td>V-Aux-Mod</td>
<td>V-Mod-Aux</td>
</tr>
<tr>
<td>$Mod &lt; V$</td>
<td>Aux-Mod-V</td>
<td>Mod-Aux-V</td>
<td>Mod-V-Aux</td>
</tr>
</tbody>
</table>

**Expectation based on normative grammar:**

If our experimental participants were adhering closely to Standard German, we should get high percentages of judgments ‘grammatical’ for order $Aux-V-Mod$ and low percentages for the remaining five orders.
Experiment 1: Method

- **Participants:**
  48 students of the University of Konstanz

- **Materials:**
  - 30 sentences, each with 6 different versions according to the 6 permutations of 3 verbs (V, Mod, Aux)
  - 5 different modal verbs

- **Procedures:**
  - SGJ and ME procedure within a single experimental session
  - 24 participants: first ME then SGJ
  - 24 participants: first SGJ then ME
Experiment 1: Procedure SGJ

**Speeded Grammaticality Judgments**

- Word-by-word presentation in the middle of the screen
- Presentation time for each word: 225 ms plus an additional 25 ms per character
- End-of-sentence judgments with a deadline of 2000 ms
- Filler sentences (ratio of experimental to filler sentences of about 1:5)
Experiment 1: Procedure ME

Magnitude Estimation

- First, a reference item is presented to which the participant assigns an arbitrary numeric value ($> 0$).
- All further items are judged in proportion to the reference item on a continuous numerical scale.
- Each individual data point is divided by the reference value and the resulting ratio is log-transformed.
## Experiment 1: Results

<table>
<thead>
<tr>
<th></th>
<th>V&lt;Mod</th>
<th></th>
<th>Mod&lt;V</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aux=1</td>
<td>Aux=2</td>
<td>Aux=3</td>
</tr>
<tr>
<td>SGJ (%)</td>
<td>86</td>
<td>57</td>
<td>26</td>
</tr>
<tr>
<td>ME (log)</td>
<td>0.51</td>
<td>0.20</td>
<td>-0.27</td>
</tr>
</tbody>
</table>

Note: The results shown here are from sessions in which each method was administered first.
Experiment 1: Results

Upper row: ME first, SGJ second
Lower row: SGJ first, ME second
Experiment 1: Summary

- In all experiments, the Standard German order $\textit{Aux-V-Mod}$ received the best judgments.
- The partially inverted order $\textit{V-Aux-Mod}$ was judged better than expected by Standard Grammar, independently of regional background.
- Speeded grammaticality judgments and magnitude estimation revealed very similar results.
Outline

1. Experiment 1: 3-verb clusters

2. A Note on Focus and Order

3. Syntactic Analysis

4. Experiments 2 and 3: 4 and 5-verb clusters

5. Summary and Discussion
Is V-Aux-Mod focus-licensed?

- Influence of information structural properties and stress placement on verb order (for recent work, see Schmid & Vogel, 2004; Wurmbrand, 2004; Sapp, 2006).
- An effect of focus has in particular been proposed for the order V-Aux-Mod:

(9) ‘I know that Peter has wanted to write a book.’

a. Ich weiß, dass Peter ein BUCH schreiben hat wollen.
   I know that Peter a book write has want

b. Ich weiß, dass Peter ein Buch SCHREIBEN hat wollen.
   I know that Peter a book write has want

c. Ich weiß, dass Peter ein Buch schreiben hat WOLLEN.
   I know that Peter a book write has want
## Selected Results

Procedure: Speeded grammaticality judgments with auditory presentation of sentences

<table>
<thead>
<tr>
<th>Focus</th>
<th>Aux=1</th>
<th>Aux=2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object Focus</td>
<td>91</td>
<td>82</td>
</tr>
<tr>
<td>Verb Focus</td>
<td>93</td>
<td>85</td>
</tr>
<tr>
<td>Modal Focus</td>
<td>93</td>
<td>69</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Focus</th>
<th>Aux=1</th>
<th>Aux=2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verb Focus</td>
<td>93</td>
<td>73</td>
</tr>
</tbody>
</table>

Note: These are preliminary results from two different experiments which included also other conditions.
Experiment 2: Summary

- The results confirm the acceptance of the partially inverted order $V$-$Aux$-$Mod$ by native speakers of German.
- Contrary to some assumptions in the literature, we found no effect of focus.
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In addition to the Standard German order Aux-V-Mod . . .

. . . the order V-Aux-Mod is also accepted by native speakers.

We call the grammar allowing these two orders Colloquial German

Disclaimer: We are not yet in a position to account for the gradience in our data.
We present a syntactic analysis modifying and extending the analysis proposed in Williams (2003).

This analysis...

- ...assumes that verb clusters are base generated and not derived by movement.
- ...belongs to the family of analyses making use of FUNCTIONAL COMPOSITION (borrowed from Categorial Grammar).
  (e.g. Steedman, 1983; Johnson, 1986; Hinrichs & Nakazawa, 1994; Meurers, 2000)
- ...places most of the information relevant for ordering in the lexicon.
- ...attributes optionality to underspecified lexical entries.
Central to CAT is the Rule of Combination.

(10) Rule of Combination

\[ X: Y + Y: Z \rightarrow [X + Y]_{X:Z} \]

(Williams, 2003: 205)

- ‘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.

If ‘X: Y’ and ‘Y: Z’ are combined by the Rule of Combination, the resulting unit is of category X and subcategorizes for Z.
(11) Lexical items:

a. *etwas* (‘something’) — DP
b. *geschrieben* (‘written’) — V: DP←
c. *hat* (‘has’) — Aux: V←
A particular grammar is obtained by specifying lexical entries for the following three types of information:

(12) Subcategorization specification
   a. Type of complement: N vs. V vs. 
   b. Order of selection: left vs. right
   c. Level of complement: X° vs. X_N

(13) Sample lexical entries for verbs in German
   a. Main verbs — V_{Main}: DP←
      V_{Main}: PP←
      V_{Main}: DP PP←
      ...
   b. Modal and auxiliary verbs — V_{Mod|Aux}: V←
There is yet another complication in verb cluster formation:

(14) Sensitivity of verb order to verb cluster complexity

a. ... dass er ein Buch **gewollt** ← HAT.
   that he a book **wanted** has
   ‘...that he wanted a book.’

b. ... dass er ein Buch HAT → **lesen wollen**.
   that he a book has **read want**
   ‘...that he wanted to read a book.’
(15) Additional complexity feature for verb clusters (renaming Williams’ 2003:184 ‘stem’ versus ‘non-stem’)
   a. Verb cluster: [VV]
   b. Simple verb: [V]

(16) Subcategorization frames for Standard German tense auxiliaries selecting a modal verb:
    Perfect tense: haben — Aux: \( \rightarrow \text{Mod}_{[VV]} \)
Complexity Variations

<table>
<thead>
<tr>
<th>V-orders</th>
<th>System 1: ( \rightarrow \text{Mod}_{[VV]} )</th>
<th>System 2: ( \rightarrow \text{Mod}_{[V]} )</th>
<th>System 3: ( \rightarrow \text{Mod} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX V MOD</td>
<td>√</td>
<td>−</td>
<td>√</td>
</tr>
<tr>
<td>V AUX MOD</td>
<td>−</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>

- **System 1:** Standard German: inversion only with complex verbal complement (cluster)
- **System 2:** inversion only with non-complex verbal complement (e.g., Pennsylvania German, see Louden, 1990)
- **System 3:** Colloquial German as suggested by our experimental results: inversion independent of complexity
Standard and Colloquial German in CAT

(17) Standard German perfect auxiliary selecting a modal verb:
    Perfect tense:  *haben* — Aux:  \(\rightarrow\)Mod\([VV]\)

(18) Colloquial German perfect auxiliary selecting a modal verb:
    Perfect tense:  *haben* — Aux:  \(\rightarrow\)Mod

\[
\begin{align*}
\text{Aux: DP} & \leftarrow \\
\text{Aux: } & \rightarrow \text{Mod} \\
\text{Mod: } & \rightarrow \text{DP} \\
\text{hat} & \\
\text{V: DP} & \leftarrow \\
\text{lesen} & \\
\text{Mod: V} & \leftarrow \\
\text{wollen} & \\
\end{align*}
\]

\[
\begin{align*}
\text{Aux: DP} & \leftarrow \\
\text{Aux: } & \rightarrow \text{Mod} \\
\text{Mod: } & \rightarrow \text{V} \\
\text{lesen} & \\
\text{V: DP} & \leftarrow \\
\text{hat} & \\
\text{Aux: } & \rightarrow \text{Mod} \\
\text{Mod: V} & \leftarrow \\
\text{wollen} & \\
\end{align*}
\]
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4 and 5-verb clusters

- **Standard German:** Auxiliary must always be in first position
- **Colloquial German** lacks idiosyncratic complexity feature
- **Positional requirement only:** auxiliary must precede modal complement

- **Prediction:** Perfective auxiliary occurs to the left of modal verb irrespective of its complexity
  - **4-verb clusters:** three of four possible auxiliary positions should be accepted
  - **5-verb clusters:** four of five possible auxiliary positions should be accepted
4 and 5-verb clusters

(19) 4-verb clusters: ... dass das Auto ... (‘that the car ...’)

Translation: ‘... that the car had to be repaired.’

a. repariert ← werden ← müssen ← HAT
   repaired  be   must  has
b. repariert ← werden ← HAT → [müssen]
c. repariert ← HAT → [werden ← müssen]
d. HAT → [repariert ← werden ← müssen]
4 and 5-verb clusters

(20) 5-verb clusters . . . dass das Auto . . . (‘that the car . . .’)

Translation: ‘. . . that the car should have been repaired.’

a. *repariert* ← worden ← sein ← müssen ← HÄTTE
   repaired    been    be    must    had
b. *repariert* ← worden ← sein ← HÄTTE → [müssen]
c. *repariert* ← worden ← HÄTTE → [sein ← müssen]
d. *repariert* ← HÄTTE → [worden ← sein ← müssen]
e. HÄTTE → [repariert ← worden ← sein ← müssen]
## Results

<table>
<thead>
<tr>
<th></th>
<th>Aux=1</th>
<th>Aux=2</th>
<th>Aux=3</th>
<th>Aux=4</th>
<th>Aux=5</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-verb clusters</td>
<td>94</td>
<td>88</td>
<td>80</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>(n = 32)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-verb clusters</td>
<td>79</td>
<td>73</td>
<td>79</td>
<td>63</td>
<td>8</td>
</tr>
<tr>
<td>(n = 13)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note: The 4-verb cluster experiment contained a second factor ‘position of modal verb’; here, only results for ‘modal after V Aux\text{passive}’ are shown.

Note: The 5-verb cluster experiment is still running and the results are therefore only preliminary.
Summary

- High acceptance rate for sentences in which auxiliary preceded modal verb (in position one, two, three (or four))
- Rejection of sentence-final auxiliary
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What is the correct generalization about the linearization of German verb clusters?

- Results are at odds with prescriptive grammar (only fully inverted auxiliary should be grammatical)
- Native speakers require inversion, but the scope of inversion is underspecified and we therefore get optionality
- Standard German and Colloquial German differ only minimally:
  - Standard German: complexity requirement on inversion
  - Colloquial German: no complexity requirement on inversion
**Syntactic Conclusion**

- What is the best syntactic account of the observed grammaticality distribution?
  - The correct syntactic analysis must imply that a grammar with optionality (Colloquial German) is less complex than a grammar without optionality (Standard German).
  - Our analysis fulfills this requirement, but others may do as well.
Is the observed optionality a matter of grammar or performance?

Our grammar allows the generation of strictly right-branching verb-clusters for all auxiliary positions.

This is shown for 3-verb clusters below . . .

```
Aux
  / \ 
Aux  Mod
   / \ 
V    Mod
```

```
Aux
  / \ 
V    Aux
   / \ 
*Mod  Mod
```

... and for 4-verb clusters here:
Conclusion:

- While verb cluster formation itself might well be a reaction to parsing pressure, . . .
- . . . the constraints on linearization still seem to be a matter of grammar.
References


