

Flavours of German necessity modals: experimental evidence

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> Topic: Flavour restrictions in a "variable flavour" modal system

- **Empirical focus:**
 - German necessity modals *müssen* and *sollen* in their non-epistemic uses
 - Comparing L1 and L2 German

> Background: The flavours of *müssen* and *sollen*

- German *müssen* and *sollen* are both necessity modals, differing in their possible modal flavours
- Exact flavour restrictions are partly controversial, e.g.:
 - Kratzer (1991): bouletic flavour for *sollen*, flavour of *müssen* unrestricted
 - Bochnak & Csipak (2018) a.o.: deontic flavour for *sollen*
 - Matthewson & Truckenbrodt (2018): largely distinct modal flavours
 - * *sollen* lexically encodes bouletic flavour (deontic readings via additional inferences)
 - * *müssen* can only express bouletic flavour if the speaker is the attitude holder
- Modal flavour restrictions are notoriously subtle, and present a challenge for language learners even at a high level of proficiency (Anthonissen & Mortelmans 2016, Howard & Leclercq 2017, Mifka-Profozic 2017)

> Experiment: Testing modal flavour restrictions on *müssen* and *sollen*

- **Generalisations** (see Matthewson & Truckenbrodt 2018):
 - *müssen* is incompatible with bouletic readings with a third person attitude holder
 - *sollen* is specified for bouletic modal flavour and compatible with third person attitude holders
- **Methods:**
 - Self-paced reading and acceptability judgements in context
- **Experimental factors:**
 - CONTEXT, levels: speaker-external bouletic vs. non-bouletic
 - MODAL, levels: *sollen* vs. *müssen*
- **Example item** (contexts translated):

(1) **Speaker-external bouletic context:** Finn wants his parents to help him buy a flat, because he has bad credit. He speaks about this with his brother. The brother knows that their parents will never agree to this. Later, Finn’s brother talks to his parents about it.

Non-bouletic (teleological) context: Finn’s parents have the goal to finally buy their own flat, but their savings aren’t sufficient. Finn knows that the only possibility is to loan money from a bank. Finn talks to his parents about this.

a. [Er sagt:] [Ihr] [sollt] [bei der Bank] [einen Kredit] [beantragen]
He says: You.PL MOD at the bank a loan apply
“He says: You SOLL apply for a loan at the bank.”

b. [Er sagt:] [Ihr] [müsst] [bei der Bank] [einen Kredit] [beantragen]
intro subject modal midfield.1 midfield.2 verb
“He says: You MUSS apply for a loan at the bank.”
- **Items and participants:**
 - 32 target items + 16 fillers + 16 controls, Latin square design with 4 lists
 - First block: Self-paced reading task, complemented with 30 attention checks
 - Second block: Acceptability judgements, 1-7 scale
 - Native speaker participants: German native speakers residing in Germany, raised monolingually, N for data analysis: **95**
 - L2 speaker participants: English native speakers residing in English speaking countries, raised monolingually, with advanced L2 proficiency of German, N for data analysis: **84**

> Predictions

- **Native speakers:** INTERACTION between the factors CONTEXT and MODAL
 - In bouletic contexts, sentences with *sollen* rated higher and read faster than sentences with *müssen*
 - In non-bouletic contexts, sentences with *müssen* rated higher and read faster
- **Comparison between speaker groups:**
 - Interaction between CONTEXT and MODAL if L2 speakers behave native-like
 - Meta-interaction with SPEAKER GROUP if L1 and L2 speakers differ

Selected references: Anthonissen & Mortelmans (2016). German modals in second language acquisition: A constructionist approach. Yearbook of the German Cognitive Linguistics Association 4. Bochnak & Csipak (2017). Reportative deontic modality in English and German. Proceedings of SuB 21. Kratzer (1991). Modality. In Semantik. Ein internationales Handbuch der zeitgenössischen Forschung. Matthewson & Truckenbrodt (2018). Modal flavour/modal force interactions in German: soll, sollte, muss and müsste. Linguistische Berichte 255. • Sorace (2011). Pinning down the concept of “interface” in bilingualism. Linguistic Approaches to Bilingualism 1.

> Results: Acceptability judgements

- **Analyses:** Ordinal logistic mixed effects models
- **Predictors:** *modal*, *context*, *interaction*, and meta-interaction with *speaker group*

Speaker Group	Context	muss (●)	soll (▲)
Native speakers	bouletic	4.5	5.5
	non-bouletic	6.2	5.6
L2 speakers	bouletic	4.8	5.3
	non-bouletic	6.0	6.0

- **Native speaker participants** rate *müssen* as more acceptable than *sollen* in non-bouletic contexts, but less acceptable than *sollen* in bouletic contexts
 - Interaction: $\beta = -2.57$, $p < .001$, 95% CI [-3.18, -1.95]
 - Note: no difference for *sollen* across contexts
- **L2 speaker participants** rate both *sollen* and *müssen* higher in non-bouletic than in bouletic contexts, and *sollen* higher than *müssen* in bouletic contexts
 - Interaction: $\beta = -0.77$, $p < .001$, 95% CI [-1.20, -0.34]
 - Note: no difference between *sollen* and *müssen* in non-bouletic contexts
- **Comparison between speaker groups:**
 - Three-way-interaction: $\beta = 1.74$, $p < .001$, 95% CI [1.17, 2.30]
 - Interaction patterns differ between L1 and L2 speakers

> Results: Self-paced reading

- **Analyses:** Linear mixed effects models for each critical region

Speaker Group	Region	bouletic-muss	bouletic-soll	non-bouletic-muss	non-bouletic-soll
Native speakers	intro	-0.15	-0.15	-0.15	-0.15
	subject	-0.25	-0.25	-0.25	-0.25
	modal	-0.35	-0.35	-0.35	-0.35
	MF1	-0.10	-0.10	-0.10	-0.10
	MF2	0.40	0.40	0.35	0.55
	verb	0.40	0.40	0.35	0.45
L2 speakers	intro	-0.15	-0.15	-0.15	-0.15
	subject	-0.25	-0.25	-0.25	-0.25
	modal	-0.35	-0.35	-0.35	-0.35
	MF1	-0.10	-0.10	-0.10	-0.10
	MF2	0.40	0.40	0.35	0.55
	verb	0.30	0.30	0.30	0.30

- **Native speaker participants** read *sollen*-sentences more slowly than *müssen*-sentences in non-bouletic contexts, but not in bouletic contexts (region “MF.2”)
 - Interaction between CONTEXT and MODAL: $\beta = 0.27$, $t = 3.07$, $p < .01$
- **L2 speaker participants** show no reliable differences in RTs across conditions
- **Comparison between speaker groups:**
 - Region MF2: No three-way-interaction ($\beta = -0.24$, $t = -1.89$, $p = .26$), significant interaction between CONTEXT and MODAL ($\beta = 0.26$, $t = 3.03$, $p < .05$)

> Discussion

- **Native speaker** data show significant interactions between CONTEXT and MODAL in offline and online measures, however:
 - **Offline data:** The interaction is driven only by a difference in the ratings of sentences with *müssen* across contexts.
- *müssen* is less compatible with speaker-external bouletic readings than with other modal flavours (Matthewson & Truckenbrodt 2018)
- **Online data:** The interaction is driven by significantly longer RTs for sentences with *sollen* in non-bouletic than in bouletic contexts.
- *sollen* is semantically bouletic, but can receive non-bouletic (deontic) interpretations via additional inferences (Matthewson & Truckenbrodt 2018)
- acceptable in non-bouletic contexts, but additional processing cost
- L2 speakers behave differently, especially w.r.t. *sollen* in non-bouletic contexts
- Hypothesis: Meaning and use-conditions of *sollen* particularly challenging for German learners, consistently with previous L2 research on interfaces between grammar and context (see Sorace 2011, 2016) → overuse in necessity contexts