

## An experimental approach to adverbial clauses: CACs and PACs are different

Adverbial clauses are assumed to have varying degrees of structural integration into their matrix clause (for German: Frey 2011; for English: Haegeman 2004). Some (e.g. temporal) adverbial clauses may be more integrated than other (e.g. adversative) adverbial clauses. Since these degrees of integration affect possible binding relations, authors have used evidence from binding as a test of integration. However, this data contains a number of complicating factors and can require fine judgements. The work reported here examines these phenomena in carefully controlled conditions, and offers new insights into the claimed structural differences between central adverbial clauses (CACs) and peripheral adverbial clauses (PACs).

Our research aim is to explore whether binding data provides reliable empirical support for current models of inter-clausal relations. We have conducted a series of experiments testing variable binding in a range of adverbial clauses of varying degrees of structural integration. For instance, we tested temporal clauses with *nachdem* ‘after’ (1a), as well as both temporal and adversative clauses with *während* ‘while’ (1b, 1c). The temporal adverbial clauses are classified as CACs in the literature, the adversative one falls into the group of PACs (Frey 2011).

A development of our experimental work which we would like to present here is our new data on concessive clauses introduced by the connector *obwohl* ‘although’ (1d), which is also a PAC (Frey 2011). We are thus able to compare the binding behaviour of two CACs (1a, b) and two PACs (1c, d).

- (1) a. *Jeder Chirurg<sub>i</sub> ist erschöpft, nachdem er<sub>i</sub> im OP gestanden ist.*  
Every surgeon is exhausted after he in.the operating.room stood is
- b. *Jeder Chirurg<sub>i</sub> flirtet mit der Krankenschwester, während er<sub>i</sub> im OP steht.*  
Every surgeon flirts with the nurse while he in.the operating.room stands
- c. *Jeder Chirurg<sub>i</sub> schläft tagsüber, während er<sub>i</sub> nachts im OP steht.*  
Every surgeon sleeps during.the.day while he at.night in.the operating.room stands
- d. *Jeder Chirurg<sub>i</sub> schläft tagsüber wenig, obwohl er<sub>i</sub> nachts im OP steht.*  
Every surgeon sleeps during.the.day little although he at.night in.the operating.room stands

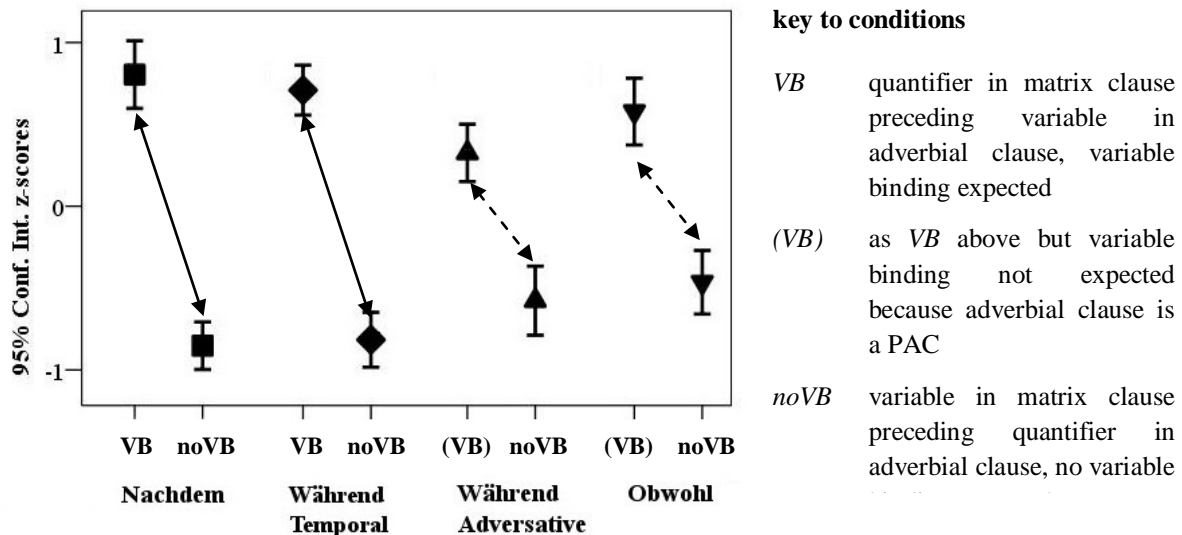
We constructed our sentence material so that the lexical form was (as far as possible) identical for all four critical adverbial clauses. The lexical form of the matrix clause varied a little more in order to make the different relationships between matrix clause and adverbial clause plausible.

We tested the four sentence types in four conditions varying on two binary parameters: these were Clause Order (matrix clause precedes, adverbial clause precedes) and Location of Quantifier (QP in matrix clause, QP in adverbial clause). Since our aim was to test whether variable binding was possible, we had to prevent participants from interpreting the variable as an unbound pronoun. We therefore added contextual *reference clarifications* to each of our target sentences. Participants were asked to judge the naturalness of each target sentence with the reading as defined in the clarification, for example as in (2).

- (2) *reference clarification: Jeder Chirurg steht im OP. Dann ist jeder Chirurg erschöpft.*  
‘Every surgeon stands in the op. room. Then every surgeon is exhausted.’  
*target sentence: Jeder Chirurg ist erschöpft, nachdem er im OP gestanden ist.*  
‘Every surgeon is exhausted after he stood in the op. room.’

The hypothesis is that we will observe different degrees of acceptability in the CACs and the PACs. In the former syntactic binding is possible, in the latter it is not. Previous studies have however shown that participants make use of pragmatic accommodation strategies. This can lead to surprisingly acceptable judgements in conditions where the quantifier precedes the (potential) variable.

The results in Fig. 1 confirm that clauses thought to have varying degrees of structural integration do indeed exhibit correspondingly varying binding behaviours, thus supporting the claim that binding is a symptom of integration (Reis 1997, Frey 2011).



**Fig. 1** Experimental results for connectors *nachdem* ‘after’, *während* temporal ‘while’, *während* adversative ‘while, whereas’, and *obwohl* ‘although’.

First of all we see there is a clear difference between possible variable binding and impossible variable binding in the temporal CACs. There is also a clear difference between the CACs and the PACs in that the gap between the natural and unnatural conditions is smaller. We account for this finding as follows: in the *VB* conditions in the CACs syntactic binding occurs and the sentences are thus judged to be acceptable. In the *noVB* conditions in the CACs variable binding is required but structurally impossible, and the consequent syntactic violation causes these sentences to be judged to be unacceptable. These conditions show a clear grammaticality difference.

The PAC conditions are responding to a different factor: in the *(VB)* conditions, syntactic binding is not possible but the arrangement of quantifier and (potential) variable is optimal for a pragmatic accommodation of the intended reading. These conditions are thus judged not optimal but also not fully unacceptable. The *noVB* conditions in the PACs must similarly be accounted for in pragmatic terms. They are fairly unacceptable but still better than the *noVB* CACs, since no syntactic violation has occurred. The PAC conditions thus illustrate the ease of pragmatic accommodation, not syntax. To interpret these results we must thus take both grammatical and pragmatic mechanisms into account.

These results therefore show, as our previous studies have done, that binding relations can provide very robust evidence for the integration status of even very closely related types of subordinate clauses. The adverbial clauses we tested all had an (almost) identical lexical form, and yet our participants clearly distinguished between the binding possibilities of the different types. We conclude first, that this evidence type is a very sound evidential basis for syntax work in this area, and second, that the theoretical work distinguishing CACs and PACs is on the right track, in that it builds upon differentiations which are verifiably psychologically real and more robustly replicable than suggested by for example Pauly (2013).

We finish this talk with a discussion of the preconditions of successful binding tests, e.g. in current work we are addressing the distinction between generic and episodic structural types.

## References

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