

CASE AND LINKING IN LANGUAGE COMPREHENSION

STUDIES IN THEORETICAL PSYCHOLINGUISTICS

VOLUME 34

Managing Editors

Lyn Frazier, *Dept. of Linguistics, University of Massachusetts at Amherst*
Thomas Roeper, *Dept. of Linguistics, University of Massachusetts at Amherst*
Kenneth Wexler, *Dept. of Brain and Cognitive Science, MIT, Cambridge, Mass.*

Editorial Board

Robert Berwick, *Artificial Intelligence Laboratory, MIT, Cambridge, Mass.*
Matthew Crocker, *Saarland University, Germany*
Janet Dean Fodor, *City University of New York, New York*
Angela Friederici, *Max Planck Institute for Human Cognitive and Brain Sciences, Germany*
Merrill Garrett, *University of Arizona, Tucson*
Lila Gleitman, *School of Education, University of Pennsylvania*
Chris Kennedy, *Northwestern University, Illinois*
Manfred Krifka, *Humboldt University, Berlin, Germany*
Howard Lasnik, *University of Maryland, Maryland*
Yukio Otsu, *Keio University, Tokyo*
Andrew Radford, *University of Essex, U.K.*

The titles published in this series are listed at the end of this volume.

CASE AND LINKING IN LANGUAGE COMPREHENSION

Evidence from German

MARKUS BADER

*University of Konstanz,
Germany*

and

JOSEF BAYER

*University of Konstanz,
Germany*

 Springer

A C.I.P. Catalogue record for this book is available from the Library of Congress.

ISBN-10 1-4020-4343-0 (HB)
ISBN-13 978-1-4020-4343-7 (HB)
ISBN-10 1-4020-4344-9 (e-book)
ISBN-13 978-1-4020-4344-4 (e-book)

Published by Springer,
P.O. Box 17, 3300 AA Dordrecht, The Netherlands.
www.springer.com

Printed on acid-free paper

All Rights Reserved
© 2006 Springer

No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording or otherwise, without written permission from the Publisher, with the exception of any material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work.

Printed in the Netherlands.

Contents

List of Figures	ix
List of Tables	xi
Preface	xiii
1. INTRODUCTION	1
1 Computing Syntactic Structures	1
2 Syntactic Ambiguity Resolution	4
3 Syntactic Function Ambiguities	7
4 Overview of the Book	16
2. INTRODUCING THE HUMAN SENTENCE PROCESSING MECHANISM	19
1 Introduction	19
2 Data for a Theory of Human Parsing	20
3 General Properties of the HSPM	26
4 Syntactic Ambiguity Resolution	28
5 First-Pass Parsing: Predicting Preferences	32
6 Second-Pass Parsing: Predicting Garden-Path Strength	38
7 Summary	46
3. WORD ORDER AND CASE IN GERMAN	49
1 Introduction	49
2 Key Features of German Clause Structure	50
3 Word Order below CP	58
4 The Case Structure of NP and DP	76
5 Summary	85

4. FIRST-PASS PREFERENCES IN SYNTACTIC-FUNCTION AMBIGUITIES	87
1 Introduction	87
2 Subject-Object Ambiguities: “Prefer Nominative!”	90
3 Object-Object Ambiguities: “Prefer Accusative!”	104
4 Deriving the Case Assignment Generalization	107
5 Summary	114
5. THE MENTAL REPRESENTATION OF CASE	115
1 Introduction	115
2 Number Attraction	117
3 Case Attraction: The Morpho-Syntactic Background	118
4 The Attraction of Dative Case	121
5 Case Attraction—Syntax or Morphology?	130
6 Summary	136
6. A MODEL OF LINKING AND CHECKING	139
1 Introduction	139
2 The Linking and Checking Algorithm	141
3 Arriving at the Initial Linking: Experiments 1 and 2	154
4 Argument Linking and Garden-Path Recovery: Experiments 3 and 4	161
5 The Primacy of Case: Experiment 5	172
6 Preliminary Summary: Argument Linking and the HSPM	177
7 Argument Linking and Sentence Memory	182
8 Disambiguation in Advance of the Verb	186
9 Summary: On Linking and Checking	194
7. CASE CHECKING AND THE HSPM I: ON LEXICAL REACCESS	197
1 Introduction	197
2 Case Checking within the HSPM	199
3 Testing Case Checking: A Preview of the Following Experiments	214
4 Experiment 1: Ungrammatical Sentences and Phonological Similarity	216
5 Experiment 2: Locally Ambiguous Sentences and DP Complexity	222

<i>Contents</i>	vii
6 Experiment 3: Switching between Structural Cases	226
7 Summary	230
8 Appendix: Summary of Statistical Results	232
8. CASE CHECKING AND THE HSPM II: THE ROLE OF WORKING MEMORY	235
1 Introduction	235
2 Working Memory and the HSPM	237
3 Experiment 1: Ungrammatical Sentences and Length	245
4 Experiment 2: Locally Ambiguous Sentences and Length	250
5 General Discussion	255
6 Summary: Case Checking and the HSPM	257
7 Appendix: Summary of Statistical Results	260
9. IN DEFENSE OF SERIAL PARSING	261
1 Introduction	261
2 Parallel Parsing and Memory Load	263
3 Parallel Parsing and Frequency	274
4 Summary	286
10. SUMMARY: LINKING, CHECKING, AND BEYOND	289
1 Introduction	289
2 The Linking and Checking Procedures of the HSPM	289
3 The Assembly of DPs	294
4 Beyond Linking and Checking	296
References	299
Author Index	313
Topic Index	317

List of Figures

1.1	A model of the HSPM	3
1.2	Overview of the core chapters	17
4.1	A model of the HSPM (repeated)	87
5.1	The method of speeded grammaticality judgments	124
6.1	A model of the HSPM (repeated)	140
6.2	The Linking-Based Checking Algorithm (LBCA)	143
7.1	The Linking-Based Checking Algorithm (LBCA) (repeated)	198
8.1	A model of the phonological loop	239
9.1	Parallel Processing of Syntactically Ambiguous Sentences	262
9.2	Parallel Processing with Pruning of Low Ranked Structures	262

List of Tables

1.1	An illustration of German Case morphology	8
2.1	Serial, parallel, and minimal commitment models	33
3.1	Case paradigm of singular definite DPs	51
3.2	Case paradigm of plural definite DPs	51
3.3	Selected permutations within a declarative clause	57
3.4	Selected permutations within a Wh-clause	57
5.1	A complete stimulus set for Experiment 1	123
5.2	Percentages of correct judgments for Experiment 1	125
5.3	Mean reactions times for Experiment 1	126
5.4	A complete stimulus set for Experiment 2	134
5.5	Percentages of correct judgments for Experiment 2	134
5.6	Mean reaction times for Experiment 2	135
6.1	A complete stimulus set for Experiment 1	157
6.2	Judgment data and mean RTs for Experiment 1	158
6.3	A complete stimulus set for Experiment 2	160
6.4	Judgment data and mean RTs for Experiment 2	160
6.5	A complete stimulus set for Experiment 3A	165
6.6	Judgment data and mean RTs for Experiment 3A	165
6.7	A complete stimulus set for Experiment 3B	167
6.8	Judgment data and mean RTs for Experiment 3B	168
6.9	A complete stimulus set for Experiment 4	171
6.10	Judgment data and mean RTs for Experiment 4	171
6.11	A complete stimulus set for Experiment 5	175
6.12	Judgment data and mean RTs for Experiment 5	176
7.1	Case paradigms for feminine and masculine singular DPs	206

7.2	Phonological similarity and Case of the definite determiner and selected possessive pronouns	217
7.3	A complete stimulus set for Experiment 1	219
7.4	Percentages of correct judgments for Experiment 1	220
7.5	Mean reaction times for Experiment 1	220
7.6	A complete stimulus set for Experiment 2	225
7.7	Percentages of correct judgments for Experiment 2	226
7.8	Mean reaction times for Experiment 2	226
7.9	A complete stimulus set for Experiment 3	228
7.10	Judgment data and mean RTs for Experiment 3	229
7.11	The effect of phonological similarity on grammatical sentences in Experiment 3	230
7.12	The effect of phonological similarity and ungrammatical sentences in Experiment 3	230
7.13	Three-way ANOVA for Experiment 1 (% correct)	232
7.14	Three-way ANOVA for Experiment 1 (RTs)	233
7.15	Three-way ANOVA for Experiment 2 (% correct)	233
7.16	Three-way ANOVA for Experiment 2 (RTs)	234
8.1	A complete stimulus set for Experiment 1	247
8.2	Percentages of correct judgments for Experiment 1	248
8.3	Mean reaction times for Experiment 1	249
8.4	The effect of phonological similarity on grammatical sentences in Experiment 1	250
8.5	A complete stimulus set for Experiment 2	252
8.6	Judgment data and mean RTs for Experiment 2	253
8.7	The effect of phonological similarity on grammatical sentences in Experiment 2	254
8.8	Case violations, garden-path strength, and ungrammaticality detection	258
8.9	Lexical effects on case violations	258
8.10	Three-way ANOVA for Experiment 1 (% correct)	260
8.11	Three-way ANOVA for Experiment 1 (RTs)	260
9.1	Frequency counts for “dass + proper name”	277
9.2	Frequency counts for SO and OS word-order	280
9.3	Frequency of types of disambiguation in Wh-questions	282
9.4	Frequency of competing structures in Wh-questions	283
9.5	Word-order and animacy in Wh-questions	285

Preface

German is a language which has received a lot of attention in linguistics, and data from German had a substantial influence on the formation of linguistic theory. The influence this language had so far on psycholinguistics and on syntactic processing in particular is much more limited, although the last 10 years have seen a growing interest in psycholinguistic investigations of German. The present monograph will build on earlier work and develop it further toward an account of syntactic comprehension on the basis of theoretical as well as experimental investigations. The verb-final nature, the free order of constituents, and the morphological Case system of German offer a rich domain for explorations which will be shown to reshape our knowledge about human sentence processing in general.

Much of the research which led to this monograph has been carried out at the Friedrich Schiller University Jena and has been concluded at Konstanz University. Our research has been supported between 1997 and 2005 by grant Ba 1178/4 of the Deutsche Forschungsgemeinschaft (DFG) under the title *Language Comprehension and Variable Word Order - Syntactic and Extrasyntactic Factors in Processing German Sentences*. We are indebted to the DFG for this continuous support over the years, and in particular to Dr. Manfred Briegel and Dr. Susanne Anschutz for their administrative help.

Different parts of this research have been presented at the Universities of Düsseldorf, Freiburg, Köln, Padua, Potsdam, at NELS 26, workshops in Groningen, Konstanz, Leipzig, Potsdam, Utrecht, various Annual CUNY Conferences on Human Sentence Processing, Annual Meetings of the German Linguistic Society (DGfS) and conferences on Architectures and Mechanisms for Language Processing (AMLaP). We have benefitted from the questions and suggestions from the various audiences.

As will be visible throughout this book, invaluable contributions to the research presented here have been made by Michael Meng, Jens-Max Hopf and, more recently, Jana Häussler. We are greatly indebted to them.

For important comments on earlier versions of the manuscript we want to thank Chuck Clifton, Lyn Frazier, Janet Fodor, Jana Häussler, Britta Stolterfoth and an anonymous reviewer.

A large number of people have shown their interest in our work by asking critical questions and making helpful suggestions. We remember in particular: Petra Augurzky, Ina Bornkessel, Ellen Brandner, Anne Breitbarth, Ulrike Demske, Gisbert Fanselow, Stefan Frisch, Peter Gallmann, Hubert Haider, Barbara Hemforth, Agnes Jäger, Lars Konieczny, Aditi Lahiri, Uli Lutz, Sandra Muckel, Frans Plank, Christoph Scheepers, Matthias Schlesewsky, Tanja Schmid, Markus Steinbach, Peter Suchsland, Susanne Trissler, Ralf Vogel, Dieter Wunderlich.

We would finally want to thank our respective wives Sandra and Jogamaya for their constant support.

Markus Bader
Josef Bayer

Konstanz, September 2005