



Universiteit
Leiden
The Netherlands

Worlds shaped by words: a cross-linguistic investigation into the neural mechanisms of lexico-syntactic feature production

Wang, J.

Citation

Wang, J. (2025, December 17). *Worlds shaped by words: a cross-linguistic investigation into the neural mechanisms of lexico-syntactic feature production*. LOT dissertation series. Retrieved from <https://hdl.handle.net/1887/4285307>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/4285307>

Note: To cite this publication please use the final published version (if applicable).

Worlds shaped by words
A cross-linguistic investigation into the
neural mechanisms of lexico-syntactic
feature production

Published by
LOT
Binnengasthuisstraat 9
1012 ZA Amsterdam
The Netherlands

phone: +31 20 525 2461

e-mail: lot@uva.nl
<http://www.lotschool.nl>

Cover illustration: picture created by Jin Wang.

ISBN: 978-94-6093-489-6
DOI: <https://dx.medra.org/10.48273/LOT0704>
NUR: 616

Copyright © 2025: Jin Wang. All rights reserved.

Worlds shaped by words

A cross-linguistic investigation into the neural mechanisms of lexico-syntactic feature production

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof. dr. ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op woensdag 17 december 2025
klokke 11.30 uur

door

Jin Wang

geboren te Tianjin, China
in 1995

Promotor: Prof. dr. N. O. Schiller
Co-promotor: Dr. Jurriaan Witteman
Promotiecommissie: Prof. dr. J.S. Doetjes
Dr. J. Audring
Prof. dr. J. Bölte (Universität Münster)
Prof. dr. A. Chaouch Orozco (City University Hong Kong)

The project has received funding from the China Scholarship Council (CSC) under grant number 202006200006.

Contents

Acknowledgements	xi
Articles in this dissertation	1
CHAPTER 1 General introduction.....	1
1.1. Existing evidence for the processing of lexico-syntactic features during speech production	2
1.2. Cross-linguistic differences in lexico-syntactic features: Grammatical gender vs. classifiers	3
1.3. Processing lexico-syntactic features in a second language.....	5
1.4. Lexico-syntactic features of semi-lexical nouns.....	6
1.5. Methods used.....	7
1.5.1. Experimental paradigms.....	7
1.5.2. Electroencephalography (EEG).....	9
1.6. Overview of this dissertation.....	10
References	12
CHAPTER 2 Processing Mandarin Chinese classifiers as a lexico-syntactic feature during noun phrase production	21
2.1. Introduction	23
2.1.1. Retrieval of lexico-syntactic features during noun phrase production	23
2.1.2. Gender congruency effect	23
2.1.3. Classifier congruency effect.....	24
2.1.4. The current study	26
2.2. Methods	26
2.2.1. Participants.....	26
2.2.2. Materials	26
2.2.3. Design and procedure.....	27
2.2.4. EEG recordings and data pre-processing	29

2.2.5. Data Analysis	29
2.3. Results	30
2.3.1. Behavioural data exclusion	30
2.3.2. Behavioural data results	30
2.3.3. EEG data exclusion	34
2.3.4. EEG data results	34
2.4. Discussion	39
2.5. Conclusions	42
Acknowledgements	43
Declaration of interest statement	43
Author contributions	43
Appendix	44
2.A Model parameters: Semantic relatedness rating scores	44
2.B EEG montage	45
References	46
CHAPTER 3 Processing of visual shape information in Chinese classifier-noun phrases	51
3.1. Introduction	52
3.1.1. The activation of lexico-syntactic features during speech production	52
3.1.2. Semantic information in classifiers	53
3.1.3. Processing of visual shape information	54
3.1.4. Electrophysiological correlates of processing classifiers	55
3.1.5. The present study	55
3.2. Methods	56
3.2.1. Participants	56
3.2.2. Materials	56
3.2.3. Design and procedure	57
3.2.4. EEG Recording and pre-processing	58
3.3. Results	59
3.3.1. Behavioural data results	59
3.3.2. EEG data results	61
3.4. Discussion	67

3.4.1. Activation of classifier nodes during noun phrase production in the BCN paradigm	67
3.4.2. Processing visual shape information in shape classifiers	68
3.5. Conclusions	69
Acknowledgements	71
Declaration of interest statement	71
Author contributions.....	71
Appendix	72
3.A Model parameters: visual similarity rating scores	72
3.B EEG montage.....	73
References	74
CHAPTER 4 Processing lexico-syntactic features in late bilinguals: ERP evidence from Chinese (L1) learners of German (L2)	83
4.1. Introduction	85
4.1.1. Lexico-syntactic features in Mandarin Chinese	85
4.1.2. Neurocognitive mechanisms of gender processing	86
4.1.3. Neurocognitive mechanisms of gender processing in L2.....	87
4.1.4. The current study	88
4.2. Experiment 1 - Grammatical gender and semantic processing during L2 German noun phrase production	89
4.2.1. Methods	89
4.2.2. Results	94
4.3. Experiment 2 - Grammatical gender and phonological processing during L2 German noun phrase production	103
4.3.1. Methods	104
4.3.2. Results	105
4.4. Discussion	115
4.5. Conclusions	117
Acknowledgements	119
Declaration of interest statement	119
Author contributions.....	119
Appendix	120
4.A Linguistic profile	120

4.B Model parameters: Semantic relatedness rating scores in Experiment 1	121
4.C EEG montage.....	122
References	123
CHAPTER 5 The activation of lexico-syntactic features in semi-lexical nouns...	129
5.1. Introduction	130
5.1.1. Processing of content words and function words	131
5.1.2. Processing of semi-lexical nouns and pseudo-partitive constructions	133
5.1.3. Activation of lexico-syntactic features during lexical access.....	134
5.1.4. The present study	135
5.2. Methods	136
5.2.1. Participants.....	136
5.2.2. Materials	137
5.2.3. Design and procedure.....	138
5.2.4. Data Analysis	139
5.3. Results	140
5.3.1. Naming accuracy.....	140
5.3.2. Naming latencies.....	141
5.4. Discussion	144
5.5. Conclusions.....	147
Acknowledgements	148
Declaration of interest statement	148
Author contributions.....	148
Appendix	149
References	151
CHAPTER 6 General discussion	159
6.1. Discussion of chapter findings	159
6.1.1. The activation of classifiers during Chinese noun phrase production	159
6.1.2. Semantic information in classifier processing.....	160
6.1.3. Grammatical gender activation during L2 noun phrase production .	161
6.1.4. Multiple processing routes for accessing grammatical gender in semi-lexical nouns	162

6.2. Limitations and future directions.....	163
References	165
Summary	169
Nederlandse samenvatting.....	173
Curriculum Vitae	177

Acknowledgements

The number of people I am indebted to on this journey is far beyond what I can fully express here. While these pages are limited, my gratitude is endless.

I am extremely grateful for the support of my supervisors. Thank you, Prof. dr. Niels O. Schiller. Without you, my academic journey in the Netherlands would never have started. Thank you for your patience in reviewing my experimental materials and manuscripts, for offering countless invaluable suggestions for our research, and for encouraging and supporting every decision I made. I have learned so much from your rigour, attention to detail, and inspiring guidance. Thank you, Dr. Jurriaan Witteman. Beyond your patient guidance in statistics and writing, you taught me how to work with discipline and efficiency. It is a lesson that will always stay with me. I greatly enjoyed your classes and learned so much from your teaching methods. I am grateful to all the scholars I met at LUCL. I learned from you both in class and in our casual talks, where I always felt warmth and gained wisdom.

I would like to sincerely thank the scholars and students at the University of Münster. In particular, I am grateful to Prof. dr. Jens Bölte, who kindly provided the language laboratory for our experiments. The help and care I received from each of you during my data collection in Germany were like a warm light in the middle of a cold winter.

I am grateful to all the reviewers and the scholars I met at conferences. Your suggestions gave me inspiration and new perspectives, deepened my understanding of my research, and helped me fall in love with linguistics again and again.

I am forever thankful to every colleague in the LUCL labs. Every time you appeared, it was like superheroes arriving, and you always made me feel secure during my experiments. Thank you for teaching me, step by step, how to use EEG and eye-tracking equipment, for helping me troubleshoot portable devices, and for patiently answering all my questions.

To my fellow PhD students in my group and all the other PhD students at LUCL, every discussion with you was a source of inspiration. Thank you for walking this journey with me and making me feel that I was never alone in my work. Special thanks to Sarah and Shaoyu for patiently answering my questions during my project. Special thanks to Yufang for explaining statistics so clearly that even complex mathematics became easier to grasp. Special thanks to Qi. Organising the LACG meetings was an entirely new experience for me. Your sense of responsibility always reassured me when I felt nervous. I am also very grateful to Katja and the PhD Council members. The activities you organised were always both enjoyable and meaningful.

Many thanks to all the administrative staff at LUCL, who consistently provided detailed answers to all my questions.

I thank the numerous kind-hearted people who appeared along my academic journey in the Netherlands. Thanks to everyone who permitted me to extensively post and circulate participant recruitment advertisements. Thank you to every participant who joined my experiments. Thanks to the landlords who accommodated me during my short-term stays. Thanks to the Lipsius reception desk staff, who kindly taught me some Dutch words each time they handed me the keys.

I am deeply thankful to my supervisors from my undergraduate and master's studies, who set me on the path of academic research. You helped a student who once knew nothing about linguistics and research discover her true passion.

I deeply appreciate my time in the Netherlands. It gave me an unforgettable academic journey and a life full of new and exciting experiences. Every day felt like unwrapping a hidden treasure from mystery boxes.

Thanks to the L.S.K.O. for letting me feel the thrill of music again. Your sense of humour and professionalism in music always made me enjoy every moment of our rehearsals. Thanks to the Chinese school for letting me experience the joy of teaching Chinese again. The students' enthusiasm could brighten my whole week. Thanks to my landlord and roommates for always sharing delicious snacks with me, knowing very well that I'm hopeless in the kitchen. Thanks to the native speakers who patiently answered my countless questions about German and Dutch. I thank the travel companions I met, who helped me discover many must-see spots I might have missed.

Everything I experienced in the Netherlands would not have been possible without the support of my family and friends in China. Thank you for crossing the time difference and distance to send me your care and love.

I truly appreciate all the people I've met along the way. Thank you for embracing my imperfections and accompanying me on this path of self-discovery. I sincerely hope that in your own journeys, you always meet warm and kind people, just as I met you.

Articles in this dissertation

This dissertation comprises a series of experimental studies, some of which have been accepted for publication or are currently under review. The subsequent list details the articles and their corresponding chapters within this dissertation.

Wang, J., Witteman, J., & Schiller, N. O. (2025). Processing Mandarin Chinese classifiers as a lexico-syntactic feature during noun phrase production. *Brain Research*, 1868, 149995. <https://doi.org/10.1016/j.brainres.2025.149995>. [Chapter 2]

Wang, J., Witteman, J., & Schiller, N. O. (2025). Processing of visual shape information in Chinese classifier-noun phrases. *Cognitive Neuropsychology*, 1–18. <https://doi.org/10.1080/02643294.2025.2485974>. [Chapter 3]

Wang, J., Witteman, J., & Schiller, N. O. (submitted). Processing lexico-syntactic features in late bilinguals: ERP evidence from Chinese (L1) learners of German (L2). [Chapter 4]

Wang, J., Witteman, J., & Schiller, N. O. (submitted). The activation of lexico-syntactic features in semi-lexical nouns. [Chapter 5]