



UvA-DARE (Digital Academic Repository)

Acquiring negative polarity items

Lin, J.

Publication date

2015

Document Version

Final published version

[Link to publication](#)

Citation for published version (APA):

Lin, J. (2015). *Acquiring negative polarity items*. [Thesis, fully internal, Universiteit van Amsterdam]. LOT.

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, P.O. Box 19185, 1000 GD Amsterdam, The Netherlands. You will be contacted as soon as possible.

Jing Lin

Acquiring Negative Polarity Items

Negative Polarity Items (NPIs) are words or expressions that exhibit a restricted distribution to certain negative contexts only. For example, *yet* is an NPI and must appear in the scope of a negation: *Mary has *(not) finished yet*. The existence of NPIs such as *yet* gives rise to a learnability problem for language-acquiring children. How do children know that the appearance of *yet*, for instance, is ungrammatical without a negation based on language input only? Are children able to detect NPIs' restricted distribution? And do they make overgeneralization errors?

By investigating the acquisition of three NPIs of different strengths and categories in both corpus and experimental studies (i.e. Dutch *hoeven* 'need', English *any* and Mandarin Chinese *shenme* 'a/some'), these questions are addressed in this book. Results of this cross-linguistic investigation show that children employ a conservative widening learning strategy to acquire NPIs, which enables them to detect NPIs' limited distributional patterns and also prevents them from making overgeneralization errors.

The exploration to the learnability of the three NPIs moreover provides answers to the question as to why NPIs are restricted to different types of negative contexts. Since different learning paths are attested for the three investigated NPIs, this book concludes that NPIs of different strengths are NPIs due to different reasons, and do not form a homogeneous class. In particular, the Dutch NPI *hoeven* 'need' bears a lexical dependency with an abstract negation neg; English *any* must be obligatory exhaustified; and Mandarin *shenme* 'a/some' is referentially deficient.

Jing Lin

Acquiring Negative Polarity Items



Acquiring Negative Polarity Items

Published by
LOT
Trans 10
3512 JK Utrecht
The Netherlands

phone: +31 30 253 6111

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

Cover illustration: 'No restrictions?' by Luc Lennart Luikens (18 months old)

ISBN: 978-94-6093-188-8
NUR 616

Copyright © 2015: Jing Lin. All rights reserved.

Acquiring Negative Polarity Items

ACADEMISCH PROEFSCHRIFT

ter verkrijging van de graad van doctor

aan de Universiteit van Amsterdam

op gezag van de Rector Magnificus

prof. dr. D.C. van den Boom

ten overstaan van een door het College voor Promoties ingestelde

commissie, in het openbaar te verdedigen in de Agnietenkapel

op vrijdag 4 december 2015, te 12.00 uur

door

Jing Lin

geboren te Liaoning, China

Promotiecommissie:

Promotor: Prof. dr. F.P. Weerman
Universiteit van Amsterdam

Copromotor: Prof. dr. H.H. Zeijlstra
Georg-August-Universität Göttingen

Overige leden: Prof. dr. E.O. Aboh
Universiteit van Amsterdam

Dr. M.D. Aloni
Universiteit van Amsterdam

Prof. dr. L.L. Cheng
Universiteit Leiden

Prof. dr. A. Giannakidou
University of Chicago

Prof. dr. J. Hoeksema
Rijksuniversiteit Groningen

Prof. dr. J.C. Schaeffer
Universiteit van Amsterdam

Faculteit der Geesteswetenschappen

Table of contents

Acknowledgements	ix
致谢词	xiii
Author contributions	xvii
Abbreviations	xxi
I Introduction	1
1 Negative Polarity Items	1
2 Acquisition of NPIs	3
3 Research questions.....	4
4 Methodology	5
5 Organisation of the dissertation.....	7
II Emerging NPIs	11
Abstract	11
1 Introduction.....	11
2 The learnability problem	13
3 Hypothesis and predictions	17
4 Methodology.....	19
5 Results and analysis	20
6 Explaining the acquisitional pathway.....	26
7 Alternative approaches.....	34
7.1 Van der Wal (1996).....	34
7.2 A lexical approach	37
8 Conclusions	40
III A learning path from lexical frames to abstract knowledge	43
Abstract	43
1 Introduction.....	43
2 Background	46
2.1 NPIs and negative contexts	46
2.2 Van der Wal (1996): a learning path of <i>hoeven</i> in tandem with the acquisition of negation.....	47
2.3 Lin et al. (2015): from [HOEF NIET] to [HOEF NEG]	49
3 Method	50
4 Experiment	51
4.1 Participants	51
4.2 Procedure	51
4.3 Design.....	52
4.4 Stimuli	52
4.5 Categorisation of the responses	53
5 Results	56
6 Discussion	62

6.1 The <i>niet-geen</i> pattern	63
6.2 The <i>niemand-weinig-alleen</i> pattern	66
6.3 The development in the unlicensed test condition	71
7 Conclusion	75
IV Mandarin <i>shenme</i> as a superweak NPI	77
Abstract	77
1 Introduction	77
2 Nonveridical contexts	80
3 <i>Shenme</i> as a superweak NPI	81
4 Explaining <i>shenme</i> as a superweak NPI	86
5 Acquiring <i>shenme</i> as a superweak NPI	87
6 Summary	90
V Distributionally constrained items in child language	93
Abstract	93
1 Introduction	93
2 <i>Shenme</i> as a superweak NPI and its learnability problem	96
3 The experiment	100
3.1 Method	100
3.2 Design	101
3.3 Participants	102
3.4 Data categorisation and scoring	102
4 Results	103
4.1 Development in the test condition of <i>wh</i> -questions	105
4.2 Development in the test conditions of negative contexts, conditional clauses and polar questions	105
4.3 Development in the test condition of epistemic uncertainty contexts and the unlicensed test condition	106
4.4 Summary	107
5 Discussion	108
5.1 The late child grammar	108
<i>Shenme in a variety of nonveridical contexts in late child Mandarin</i>	108
<i>Poor imitation performance in epistemic uncertainty contexts by older children</i>	111
<i>No overgeneralising grammar in late child Mandarin</i>	114
<i>Shenme is a superweak NPI in late child Mandarin</i>	116
5.2 The early child grammar	116
<i>Shenme in wh-questions in early child Mandarin</i>	116
<i>Shenme in the scope of a sentential negation in early child Mandarin</i>	117
<i>Shenme is not yet analysed as an NPI in the early child grammar</i>	119
5.3 When do children develop the late child grammar?	119
6 Conclusions	121

VI NPIs of different strengths are NPIs for different reasons	123
Abstract	123
1 Introduction.....	123
2 Three approaches to the <i>licensee</i> question	128
2.1 Polarity as a result of incorporated negation (Postal 2000).....	128
2.2 Polarity as a result of obligatory exhaustification (Chierchia 2004, 2006, 2013)	131
2.3 Polarity as a result of non-referentiality (Giannakidou 2002, 2011)	134
2.4 No competitive approaches to NPI-hood	137
3 Methodology	138
3.1 Selected NPIs	139
3.2 Selected corpora.....	139
3.3 The procedure	140
4 Results	141
5 Explaining the acquisitional pathways.....	146
5.1 The same learning strategy	146
5.2 Distinct acquisitional pathways	149
5.2.1 Dutch <i>hoeven</i> : from [HOEVEN NIET] to [HOEVEN NEG].....	149
5.2.2 English <i>any</i> : from bearing an immediate scopal relation with \neg to bearing [σ].....	151
5.2.3 Mandarin <i>shenme</i> : from <i>wh-indefinite</i> to <i>non-referential indefinite</i>	155
6 Conclusion: Different properties underlying NPI-hood	158
VII Conclusion	161
1 The learnability problem	161
2 The acquisitional patterns	162
3 Reasons underlying NPI-hood	165
References.....	167
Appendices.....	181
Summary: Acquiring Negative Polarity Items	197
Samenvatting: De verwerving van negatief-polaire uitdrukkingen.....	205
Curriculum Vitae	213
简历	215

Acknowledgements

Linguistics is a field I never thought about when I was in high school. At that time my dream was to become a physicist, who could explain and predict daily-life phenomena by using various fascinating formulas. If somebody would have asked me then what linguistics is about, I most likely would have said that it is about learning languages. Now that I myself am a linguist, I know how funny it is to think about the field in that way.

My interest for linguistics emerged when I did my BA in Dutch Language and Culture at the Communication University of China (CUC). I owe this to my very first linguistics teacher Feng Li at CUC, from whom I first heard about VO and OV word order, and who talked about evolution when explaining why lions cannot phonetically produce the same sounds as human beings. Without him, I would have never discovered my interest for the field, now an important part of who I am.

But Li's course (General Linguistics) was far from sufficient for me to obtain what I needed to become a real linguist. After completing my BA in 2006, and one year of doing mainly translation work in Beijing, I made my decision to come to the Netherlands to further study Dutch linguistics. It was not an easy choice for a Chinese, who had grown up and already lived in China for almost twenty-five years; but it was definitely the right choice since it provided me with the opportunity to study (Dutch) linguistics at an advanced level.

It was November 2007 when I first went to the PC Hoofthuis of the University of Amsterdam (UvA) to meet Wil Dropvat for advice about following the MA programme in Dutch Language and Culture at the UvA. Since I had a BA degree from outside Europe, and my BA programme lacked fundamental courses on linguistics, she told me, Fred Weerman required that I first complete three obligatory BA courses on Dutch linguistics before I could start the MA programme. When I heard of this decision, I didn't know at all that he would become a very important person (VIP) in my life!

Fred, I must thank you for the trust you gave me all these years, from the moment I applied for the MA programme. Without that trust, I would never have had the opportunity for further studies in (Dutch) linguistics. I thank you for sharing your knowledge in the field, and your wisdom as an experienced professor and mentor. I also thank you for giving me the chance to work as your PhD student the last four years, from which I have learnt a lot – not only about linguistic research.

Another person that I must thank is Hedde Zeijlstra, not only because he was the first to introduce me to Negative Polarity Items, but also because of his confidence in me to execute this PhD project, and his encouragements all these years. Hedde, I thank you for all your intelligent thoughts and insightful talks with me! I am also very grateful for your support

during my PhD project – both content-wise and emotionally. I have learnt a lot from you about semantics, but you have also inspired me with your passion for the field, and your ambition.

I need to thank Jan Don. Jan, it was you who first made me aware of the rMA programme in Linguistics at the UvA. Without you I would not have had the opportunity to do my second master's, which provided a crucial part of the foundation for my PhD project. I thank you for your insightful supervision during my (r)MA studies at the UvA and all that you have taught me on morphology. It was also your enthusiasm for the field that showed me that being a linguist is not something dry or boring but that it can be very exciting!

Suzanne Aalberse and Olaf Koeneman, I would like to thank you both for being great teachers and for the knowledge you have shared with me. Suzanne, do you still remember writing me that I would make a good PhD candidate when I just started my MA programme in Dutch Language and Culture? Olaf, you asked me if I considered doing a PhD project when I was your assistant for a BA course. These remarks were early inspirations that set me on the path towards becoming a PhD student, and have given me confidence throughout the past four years.

I thank all my colleagues at the PC Hoofthuis and the Bungehuis for the great atmosphere and insightful talks and discussions, inspiring!

Gennaro Chierchia and Anastasia Giannakidou, my sincere thanks for all your guidance and support during my exchange studies at Harvard University and the University of Chicago in 2014.

I would like to thank the following educational institutions in the Netherlands and China: child day care centres De Blauwe Walvis in Utrecht and De Zeesterretjes in Egmond aan Zee; preschools 't Peuterslot and De Troetertjes in Egmond Binnen; primary schools De Lichtlijn and Comenius in Den Helder, and De Branding in Egmond aan Zee; public primary schools Boswaid in Egmond aan den Hoef, Sint Bavo School in Haarlem; and Qiseguang Kindergarten in Dandong, China. Without the collaboration and the participation of these institutions, I would not have been able to collect all the data reported in this dissertation. I owe many thanks to the little participants and their parents for their understanding and cooperation. I thank Sabine Van Reijen for recording the Dutch stimuli; also, many thanks to Ava Creemers, Fang Fang, Marlijn Meijer, Caitlin Meyer, Tonya Sudiono, Ilse Van de Blankevoort, and Sabine Van Reijen for data collection.

Moreover, I would like to thank Rachael Garcia, Tijmen Klous, and Caitlin Meyer for their help editing this dissertation.

Having moved from China at the age of twenty-five, I don't have many friends in the Netherlands. Hailiang Yu, although based in China has remained a very loyal and true friend throughout the years. Thank you for your moral support! Caitlin Meyer was a classmate during my rMA programme and has become a very good friend over the years. You listened to me and helped me in numerous discussions. I clearly remember the whole day you took out of your schedule to help me solve an unexpected

issue with my Dutch experiment. Thank you for being a friend and a great sounding board!

Finally, I, as an individual person, would have never existed without my parents: my Korean and Mandarin-speaking mum Yu Jin, and my dad Zhimin Lin. Mum and dad, I have been too traditional to tell you that I am so grateful that you brought me into this world, and have since done your best to provide me the best education, the warmest family atmosphere, and the freedom to choose my own path in life, allowing me to grow – something quite out of the ordinary in China. Mum and dad, I also want to thank you a lot for all your understanding and support ever since I chose to live and work abroad! Now that I myself will become a mother soon, I am starting to understand more about being a parent.

Speaking of becoming a mother, I want to thank you, Huib van de Grijspaarde, of course not just for giving me our baby. ☺

致谢词

在我上高中的时候，语言学是一个我从未考虑过的领域。那个时候，我的梦想是成为一名可以用各种各样的公式解释并且预测日常生活现象的物理学家。如果那个时候有谁问我语言学是做什么的，我很有可能会回答：语言学不就是关于学习语言的嘛。如今我自己成为了一名语言学家，想想自己当时关于这个领域的想法不禁会觉得很有趣。

我对语言学的兴趣是我在中国传媒大学读本科荷兰语语言与文化的时候产生的。这要归功于我的第一位语言学老师——中国传媒大学的李峰副教授。在李老师的课堂上，我第一次知道谓宾和宾谓两种不同的语序；也是在李老师的课堂上，我明白了为什么生物进化论能够解释狮子不能和人类发出相同的可以组成语言的声音。没有李老师，我永远也不会发现我对语言学的浓厚兴趣。

但是李老师《普通语言学概论》这门课远远不足以让我获取足够的知识而成为一名真正的语言学家。二零零六年，我本科毕业，拿到了学士学位。在北京做了一年基本上以翻译为主的工作之后，我终于决定要到荷兰继续学习荷兰语语言学。对于一个在中国出生并学习生活了将近二十五年的中国人来说，决定出国留学并不是一件容易的事情。但是，这绝对是一个正确的选择，因为它给我提供了能够有质量地学习（荷兰语）语言学的宝贵机会。

我第一次到阿姆斯特丹大学的 PC Hoofthuis 教学楼是在二零零七年的十一月份。当时我是去见面 Wil Dropvat 女士，向她咨询我在阿姆斯特丹大学读荷兰语语言与文化硕士项目的可能性。由于我是在欧洲境外的学校拿到的学士学位，而且我的本科项目并不包含系统的语言学课程，她告诉我说 Fred Weerman 教授建议我在读研究生之前，先要完成本校学生必修的三门语言学类的本科课程。如果我能按时修完这三门本科必修课，就可以开始读荷兰语语言与文化的硕士课程。当我听到这个决定的时候，我根本不知道 Weerman 教授将会成为我生命中一个非常重要的人（VIP）！

Weerman 教授，我必须感谢你这么多年来对我的信任——从我申请研究生项目的那一刻开始。没有你的那份信任，我永远也不可能有机会可以深入学习（荷兰语）语言学。我很感激你这些年来对我在学科领域里的指导；你作为资深教授和导师独有的睿智见

解也让我收益颇多。我也很感谢你给我机会在过去的四年里成为你的博士生。这四年里，我学到了很多——不仅仅是关于语言学研究的。

另外一个我必须感谢的人是 Hedde Zeijlstra 教授，不仅是因为他是第一个让我知道负极词的老师，更因为他对我的信任和这些年来对我的鼓励。Hedde，你的智慧和你在学科领域内独到的见解令我受益匪浅！同时，我也特别感激你在我四年博士研究期间对我的支持和激励——不论是学术上的还是精神上的。你教授了我许多语义学的知识；更重要的是，你对语言学的热忱还有抱负一直深深地感染并激励着我。

我还要谢谢 Jan Don。Jan，是你向我介绍了阿姆斯特丹大学的研究类硕士项目语言学。没有你，我不可能有机会攻读我的第二个硕士学位，从而为日后的博士项目研究打下了重要并坚实的学术基础。我感谢你在我攻读两个硕士学位期间对我的谆谆教导，还有你所传授给我的所有词汇学的知识。是你对语言学的热忱让我明白，语言学的研究并不枯燥无味；语言学家的工作是令人热血沸腾的！

Suzanne Aalberse 和 Olaf Koeneman，我十分感谢你们这些年来对我在语言学领域的知识传授。Suzanne，你还记得你曾经发邮件和我说，我会成为一个很好的博士生吗？当时的我才刚刚开始修读研究生项目荷兰语语言与文化。Olaf，你曾经问过我会不会考虑硕士毕业后继续攻读博士学位。当时的我还是你上的一门本科课程的教学助理。你们的这些话启发了我攻读博士学位的想法；也是你们的这些话在过去的四里不断地激励着我，给我信心。

我要感谢所有 PC Hoofthuis 和 Bungehuis 的同事，感谢你们共同创造了一个积极的学术氛围，还有你们有学术见地并引人思考的讲座，课程，以及讨论！

Gennaro Chierchia 教授和 Anastasia Giannakidou 教授，我诚挚地感谢你们在我二零一四年在哈佛大学和芝加哥大学交流期间对我的指导和支持。

我还要感谢下述荷兰和中国的教育机构：Utrecht 的儿童日托中心 De Blauwe Walvis；Egmond aan Zee 的儿童日托中心 De Zeesterretjes；Egmond Binnen 的幼儿园 't Peuterslot 和 De Troetertjes；Den Helder 的 De Lichtlijn 小学和 De Comenius 小学；Egmond aan Zee 的 De Branding 小学；Egmond aan den Hoef 的 Boswaid 公共小学；Haarlem 的 Sint Bavo School 公共小学；还有中国丹东市的七色光幼儿园。没有这些机构的合作以及参与，我不可能收集到在这本博士

论文中所发表的实验数据。我十分感谢所有参与实验的小朋友还有他们家长对于我的研究的理解以及合作。我还要感谢 Sabine Van Reijen 为我的荷兰语实验录制了测试条目；感谢 Ava Creemers, Marlijn Meijer, Caitlin Meyer, Tonya Sudiono, Ilse Van de Blankevoort, Sabine Van Reijen 还有房芳协助我进行数据采集。

另外，我还要谢谢 Rachael Garcia, Tijmen Klous 和 Caitlin Meyer 帮我编辑博士论文。

在二十五岁的年龄离开中国，我在荷兰并没有什么朋友。于海亮，在中国的时候，我们就已经是很好的朋友；尽管这些年来，我们很少见面，可是你仍然是我最忠诚的朋友。谢谢你一直以来对我精神上的支持和鼓励！Caitlin Meyer，你是我在修读第二个硕士学位时认识的一位同学；而如今，你成为了我的好朋友。感谢你在无数次的讨论中对我的倾听和帮助。我还清楚地记得有一次，你不顾自己的工作计划，用一整天的时间帮我解决了一个突发的实验情况。谢谢你这些年来对我的帮助和支持！

最后，我要感谢我的父母：我的会说朝中两种语言的妈妈金玉，还有我的爸爸林志民。没有他们，我不可能作为一个独立的个体存在！爸爸妈妈，我一直都太过于传统，从来也没有对你们说过我很感激你们赋予我生命，把我带到这个世界上来；我也从来没有对你们说过我很感谢你们这么多年来一直尽最大的努力给我提供最好的教育，最温暖的家庭环境，还有让我可以自由发展选择自己生活方式和方向的空间——一个在中国并不普遍的教育观念。爸爸妈妈，我还要谢谢你们从我决定要出国生活和工作的那一刻起，对我的理解和支持！现在的我也将为人母，我开始渐渐地理解作为父母的那种心情和愿望。

说到将为人母，我很想对你，Huib van de Grijsparde，说声谢谢——当然不仅仅是因为你给了我我们的宝宝☺

Author contributions

Chapter I. Introduction

Jing Lin

Chapter II. Emerging NPis: the acquisition of Dutch *hoeven* 'need'

Lin, Jing, Fred Weerman, and Hedde Zeijlstra. 2015. Emerging NPis: The acquisition of Dutch *hoeven* 'need'. *The Linguistic Review* 32(2):333-374, DOI: [10.1515/tlr-2014-0025](https://doi.org/10.1515/tlr-2014-0025)

Weerman and Zeijlstra posed the research question of how Dutch children are able to acquire the NPI modal verb *hoeven* 'need' in the absence of negative evidence. In order to explore this research question and to obtain an overview of how the development would proceed, Lin performed an intensive search in the CHILDES database (MacWhinney 2009) and applied statistical analysis to the corpus results. With input from Weerman and Zeijlstra, Lin drew a developmental pattern in the acquisition of the Dutch NPI. Lin wrote the first version of this paper; and based on feedback from Weerman and Zeijlstra during several supervision meetings, Lin rewrote and revised the paper into its final, published version.

Chapter III. A learning path from lexical frames to abstract knowledge: evidence from Dutch children's acquisition of NPI modal *hoeven* 'need'

Jing Lin, Fred Weerman, and Hedde Zeijlstra. (Under revision.)

Weerman and Zeijlstra posed the research question of how Dutch children are able to acquire the NPI modal verb *hoeven* 'need' in the absence of negative evidence. Based on the corpus findings in the previous corpus studies by Van der Wal (1996) and Lin et al. (2015), Lin, Weerman and Zeijlstra together designed the experimental study presented in this paper: an elicited imitation task. Lin first designed the stimuli, and adjusted the stimuli based on input from Weerman and Zeijlstra. Lin set up the experiment with both its audio stimuli and visual support. Lin applied for approval with the Ethical Committee of the ACLC at the Faculty of Humanities, recruited the participants, and ran the experiment. Lin transcribed the audio recordings with the participants, entered the data, and did the statistical analysis of the experimental results. With input from Weerman and Zeijlstra, Lin interpreted the results and concluded a learning path from lexical to abstract knowledge in Dutch children's acquisition of the NPI *hoeven* 'need'. Lin wrote the first version of this paper, and revised and rewrote the paper on the basis of Weerman and Zeijlstra's feedback during

several supervision meetings. Lin submitted the paper, which is now under revision.

Chapter IV. Mandarin *shenme* as a superweak NPI

Lin, Jing, Fred Weerman, and Hedde Zeijlstra. 2014. Mandarin SHENME as a superweak NPI. In *Black Book: a festschrift in honor of Frans Zwarts*, 229-251, eds. Hoeksema, Jack, and Dicky Gilbers. Groningen: University of Groningen.

Weerman and Zeijlstra posed the research question of how the learnability problem raised by the existence of NPIs in natural languages can be solved. Given Lin's linguistic background, and the fact that Mandarin exhibits an indefinite NPI that shows a distributional pattern of a proto-typical superweak NPI, *shenme* 'a/some' was selected as the target of investigation. In order to understand more about the NPI of interest, Lin did the literature research and reviewed the previous theoretical studies on this NPI. To explore the learnability problem of the NPI, Lin did an intensive search in the CHILDES database (MacWhinney 2009) for data collection. Subsequently, Lin statistically analysed the corpus results; with feedback from Weerman and Zeijlstra, Lin concluded a learning pathway exists in which Mandarin children start with a *wh*-analysis of *shenme* and make a reanalysis of *shenme* as a superweak NPI shortly after the age of four. Lin wrote the first version of this paper, and rewrote and revised the paper into its final, published version, with valuable feedback from Weerman and Zeijlstra during several supervision meetings.

Chapter V. Distributionally constrained items in child language: acquisition of the superweak NPI *shenme* 'a/some' in Mandarin Chinese

Jing Lin. (Under review.)

Chapter VI. NPIs of different strengths are NPIs for different reasons: what language acquisition tells us about the nature of NPIs

Jing Lin, Fred Weerman, and Hedde Zeijlstra. (To be submitted.)

Lin, Weerman, and Zeijlstra together posed the research question of what language acquisition can tell us about the reasons underlying NPI-hood. To explore this research question, the three authors decided to investigate possible learning patterns in the acquisition of NPIs of different strengths, by means of corpus research. Lin did the data collection in the CHILDES database (MacWhinney 2009) for the three selected NPIs: Dutch *hoeven* 'need', English *any*, and Mandarin Chinese *shenme* 'a/some', and categorised the corpus results based on the licensing status and licensing conditions of the investigated NPIs. Subsequently, Lin applied statistical

analyses to the collected corpus results. Based on feedback by Weerman and Zeijlstra, Lin described a learning pathway for each of the investigated NPIs and interpreted the pathways as representing different processes of analysis and reanalysis in the acquisition of the NPIs. On the basis of the corpus findings, Lin, Weerman, and Zeijlstra together drew the conclusion that NPIs of different strengths have become NPIs due to completely different reasons. Lin wrote the first version of this paper; and based on insightful input from Weerman and Zeijlstra during several supervision meetings, Lin rewrote and revised the paper into its current form.

Chapter VII. Conclusions

Jing Lin

Abbreviations

AM	Anti-Morphic
AA	Anti-Additive
ADJ	adjectiviser
BNC	the British National Corpus
CGN	het Corpus Gesproken Nederlands (the Spoken Dutch Corpus)
CHILDES	Child Language Data Exchange System
CL	classifier
COMP	complementiser
COP	copular
D	domain
DA	domain alternative
DE	Downward Entailing
df	degree of freedom
FCI	Free Choice Item
GEN	genitive marker
INF	infinite verb
INF-LE	inference <i>le</i>
LIT.	literary translation
M	mean
MLU	Mean Length of Utterance
MOD	modifier
N	sample size
NEG	negation
NP	noun phrase
NPI	Negative Polarity Item
NV	nonveridical
O	abstract exhaustification operator
OV	object-verb
PAR	particle
PERF	perfect tense marker
PKU-CCL	PKU-CCL Yu Liao Ku (the PKU-CCL Corpora)
PL	plural
PPI	Positive Polarity Items
PROG	progressive marker
Q(-MARKER)	question marker
REL	relative clause marker
SA	scalar alternative
SD	standard deviation
SG	singular
VO	verb-object

Chapter I

Introduction

Every natural language exhibits some lexical elements whose distribution is restricted in one way or another. Some adjectives in English, for example, may only appear in predicative but not in attributive position. This is shown in (1) and (2).

- (1) a. The man over there is *ill*.
b. *The *ill* man is over there.
- (2) a. The baby over there is *asleep*.
b. *The *asleep* baby is over there.

The focus of this dissertation is on a subgroup of such distributionally constrained elements in natural languages: *Negative Polarity Items* (NPIs), which are elements that are restricted to negative contexts. This dissertation investigates NPIs from a perspective of language acquisition. In Section 2, I motivate why investigating acquisition is important when we study NPIs. After that I continue by presenting the research questions in Section 3 and the methodology in Section 4. I conclude this chapter with a roadmap of the dissertation in Section 5. But first I will briefly introduce what NPIs are and how they are distributed.

1 Negative Polarity Items

NPIs refer to words or expressions that can only appear in environments that count as negative in some way (cf. Ladusaw 1979). An example is the English adverb *yet*. As is illustrated below, *yet* is only grammatical when it appears in a negative context: in the scope of the sentential negation *not* as in (3a), or in the scope of a negative indefinite such as *nobody* in (3b). Another example of NPIs in English is *to lift a finger*, an idiomatic expression that exhibits a limited distribution to negative environments too; see (4).

- (3) a. John has *(not) eaten *yet*.
b. Nobody/*Somebody has eaten *yet*.
- (4) a. John *(didn't) *lift(ed) a finger* to help me.
b. Nobody/*Somebody *lifted a finger* to help me.

NPIs are not restricted to English only, but form a cross-linguistic phenomenon. The Dutch adverbial phrase *ook maar* 'at all' is an NPI (Van der Wouden 1997), as illustrated in (5). Mandarin *renhe* 'any' also exhibits a

2 Acquiring Negative Polarity Items

distribution that is restricted to negative environments (Giannakidou and Cheng 2006; Wang and Hsieh 1996). This is shown in (6).

- (5) a. Het is *(niet) het geval dat Jan ook maar iets
it is not the case that John at all things
heeft gezien.
has seen
'It is not the case that John has seen anything at all.'
- b. Niemand/*Iemand heeft ook maar iets gezien.
nobody/somebody has at all things seen
'Nobody has seen anything at all.'
- (6) a. Yuehan zuotian mei mai renhe shu.
John yesterday not buy any book
'John did not buy any books yesterday.'
- b. *Yuehan zuotian mai-le renhe shu.
John yesterday buy-PERF any book
Intended: 'John bought some books yesterday.'

Basque (Laka 1990), Dutch (Hoeksema 2000; Van der Wouden 1994), Greek (Giannakidou 1999), Hindi (Mahajan 1990), Korean (An 2007, Nam 1994), Mandarin Chinese (Cheng 1994, Wang 1993), Spanish (Herburger 2003), etc., all have NPIs. The reader is further referred to Haspelmath (1997) for a cross-linguistic overview in this respect.

The existing literature has focused on (but is not restricted to) various topics within the study of NPIs, including the attested cross-linguistic variation of NPIs (Giannakidou 2011; Haspelmath 1997), and the different syntactic and semantic categories that can form NPIs (Hoeksema 1994; Israel 1996; Van der Wouden 1994). The taxonomy of NPIs in terms of strengths is also one of the topics that have been studied in the past thirty years. Depending on the exact distributions of NPIs, namely what kind of negative contexts can and cannot license an NPI, different polarity strengths are distinguished (Van der Wouden 1994; Zwarts 1986, 1998). For instance, *strong* NPIs are licensed in – what Zwarts (1998) dubs – *classical negative contexts* only, such as in the scope of a sentential negation or a negative indefinite; whereas *weak* NPIs can also appear in weaker negative environments, *minimally negative contexts* in his terms, like those introduced by *few* or *hardly* in English, and conditional clauses. *Superstrong* NPIs exhibit a stronger strength compared to strong NPIs, as they are allowed to appear in the scope of a sentential negation only. Compared to weak NPIs, *superweak* NPIs are also attested in negative environments that are even weaker than minimally negative contexts, such as epistemic uncertainty contexts, or in the complement of a non-factive verb.

Other topics that have attracted scholars' attention within the study of NPIs have involved, for instance, the question of what are the descriptive characteristics of a proper licenser for NPIs (the so-called *licenser* question posed in Ladusaw 1996). Answering this question can lead to a linguistic

generalisation of licensing conditions under which the appearance of NPIs are considered felicitous; for example, *Downward Entailing* contexts turn out to be proper and sufficient licensing environments for NPIs such as *any* (cf. Ladusaw 1979).

Another question is why NPIs have become NPIs, to the extent that they must be restricted to certain negative environments in their distributions. This is also known as the *licensee* question in the literature (cf. Ladusaw 1996). This research topic focuses on NPIs themselves, and explores the reasons or properties underlying NPI-hood. For instance, Kadmon and Landman (1993) have tried to explain why *any* (but not *a/an*) is an NPI by analysing *any* as having a domain widening effect.

This dissertation addresses a different topic in the study of NPIs than those mentioned above, which – to the best of my knowledge – has attracted little attention in the literature thus far: the acquisition of NPIs. In the next section, I will motivate why this choice does not merely fill the gap in the existing literature, but also provides insight into our understanding of some of the research questions summarised above, such as the *licensee* question, and also the NPI taxonomy in terms of polarity strength.

2 Acquisition of NPIs

In this section, I will present two reasons to look at how children acquire NPIs in this dissertation. One reason is related to a learnability problem raised by the existence of NPIs in natural languages (cf. Tieu 2010; Van der Wal 1996); and the other reason is that studying the acquisition of NPIs may provide insight into our understanding of the nature of NPIs.

Language acquisition is based on *positive evidence*, i.e. language input (cf. Marcus 1993; Pinker 1984, 1995), in which grammatically uttered sentences are attested. This means that in the particular case of NPIs, language learners are only confronted with constructions in which NPIs are properly licensed. Ungrammatical utterances containing unlicensed NPIs, on the other hand, are absent in the language input.

But absence of evidence is not evidence of absence. Absence of certain constructions in language input does not necessarily entail that such constructions are ungrammatical. The question then arises as to how children are able to detect the restricted distributions of NPIs based on positive evidence only. In that case, acquisition of NPIs would require *negative evidence*, such as corrective feedback or explicit instructions on NPIs' ungrammaticality in non-licensing contexts (cf. Baker and McCarthy 1981; Marcus 1993; Pinker 1995; among others). But, as is widely reported, children do not show to benefit from negative evidence in early stages of language acquisition (Braine 1971; Gropen et al. 1991; Manzini and Wexler 1987; Marcus 1993; Pinker 1995; among many others). Hence, the existence of NPIs in natural languages leads to a learnability challenge for

4 Acquiring Negative Polarity Items

language-acquiring children: how are they able to detect NPIs' restricted distribution based on positive evidence only?

Nonetheless, the literature thus far only features a few studies in which the learnability problem of NPIs is addressed. These studies restrict to English *any* (Tieu 2010, 2013), Dutch *hoeven* 'need' and *meer* 'more' (Koster and Van der Wal 1996; Van der Wal 1996). The small amount of research on the learnability problem of NPIs therefore forms the primary motivation for choosing acquisition as the current research topic.

Another reason why acquisition is an interesting and also a fruitful research topic in the study of NPIs is that it may help us understand more about the nature of NPI-hood. The reasoning here is straightforward: how we eventually analyse our native language is a result of how we have acquired it. Investigating the learning process in language development can therefore provide insight into how grammar is represented in our mind. Turning to NPIs, this means that analysing how language learners acquire NPIs can tell us how NPIs may be represented in their grammar in different phases of language development. This can help us understand why these distributionally constrained items are restricted in their distribution, which may shed light on the question of why NPIs are NPIs (i.e. the so-called *licensee* question in Ladusaw (1996). Acquisition of NPIs can thus serve as a window on the nature of NPI-hood.

In short, investigating acquisition of NPIs does not only solve an empirical learnability problem but also has theoretical implications for the reasons(s) underlying NPI-hood. Within this research theme, I will present my research questions in the next section.

3 Research questions

This dissertation addresses three research questions. I will first present these questions and then explain these questions in more detail.

(7) Research questions:

Q1: What kind of learning mechanism(s) do children employ in their acquisition of NPIs?

Q2: What possible learning pathway(s) can be attested in the acquisition of NPIs?

Q3: What does acquisition of NPIs tell us about the nature of NPIs?

Research question Q1 aims to investigate possible learning mechanism(s) underlying children's acquisition of NPIs. Addressing this question can first help us understand whether children are able to acquire NPIs such that they can detect their restricted distributions based on positive evidence only, and

then help explore what kind of learning mechanism(s) children may employ during the acquisition. The answer to this research question provides a solution to the learnability problem raised by the existence of NPIs, which may eventually help us understand children's acquisition of distributionally constrained items in general.

Research question Q2 concerns possible learning pathway(s) that are attested during the acquisitional trajectory of NPIs. In particular, I will explore the developmental paths in the acquisition of NPIs in different languages (i.e. in Dutch, English, and Mandarin Chinese), and of different polarity strengths (i.e. strong, weak, and superweak NPIs). Investigating the acquisitional patterns of different NPIs can help us find out whether similar developmental phases can be described independent of the NPIs involved. Moreover, answering Q2 can provide insight into whether different NPIs are acquired via one and the same learning mechanism; as such, it is an extension of research question Q1.

Research question Q3 involves possible theoretical implications for the study of NPIs from the perspective of language acquisition, since it is posed with the aim of understanding what acquisition can tell us about possible reasons and/or properties for which NPIs have become polarity sensitive. The reasoning for this has already been presented in Section 2: if the analysis of a language system by speakers emerges as a product of their language acquisition, then analysing acquisitional path(s) of NPIs will tell us why NPIs are NPIs. Acquisition can therefore serve as a window on the nature of NPIs. Answering Q3 will eventually help us understand NPI-hood, and to find out whether different NPIs are all generalisable by one and the same property.

4 Methodology

In order to explore the acquisition of NPIs, this dissertation will employ two kinds of research methods: corpus studies in the CHILDES database (MacWhinney 2009) and experimental studies with an elicited imitation task (e.g. Eisenbeiss 2010; Keenan and Hawkins 1987; Lust et al. 1996; Montgomery et al. 1978; Panitsa 2001; Vinther 2002). The corpus research will be carried out to provide a detailed description of the development of the distributions of NPIs in child language. This will be useful in describing the learning path(s) and, if applicable, distinguishing different developmental stages. Experiments will be designed to test the learning patterns already attested by means of the corpus exploration. Experimental studies are not restricted to (spontaneous) production. Unlike corpus research, the employment of experiments will therefore make it possible to assess the exact range of children's knowledge of NPI licensing at different ages.

After introducing the research methods, I will now motivate the sample of NPIs that will be investigated in the current dissertation. As Section 1 already introduces, NPIs form a cross-linguistic phenomenon.

6 Acquiring Negative Polarity Items

NPIs of different categories and strengths are often attested within one language. For instance, Hoeksema (2013) reports 841 NPIs in Dutch. However, although many languages exhibit NPIs of different strengths and/or categories, this is not always the case in child language.

I here take Dutch *mals* 'mild' as an example, which is a superstrong NPI that can only survive in the scope of a sentential negation: *Deze kritiek is niet mals* 'This critique is not mild'. In child-directed Dutch, based on examination of the CHILDES database, this NPI is never attested.¹ Although the absence of *mals* in the investigated corpora does not necessarily indicate its absence in the language input, the corpus data at least provide a representative and quantitative view of how infrequent this NPI may be in the input. The absence of *mals* in the input may in turn explain why this NPI is not attested in child language: if an NPI is not sufficiently frequently used in adult language speech towards language-acquiring children, language learners do not seem to be able to use or acquire this NPI in early childhood.² This would result in lack of data for analysis. This observation restricts the sample of NPIs that will be investigated in this dissertation to only those that are relatively frequently attested in both child-directed speech and child language use – at least in the available corpora in the CHILDES database.

In order to maintain the cross-linguistic characteristics of this research (since NPIs are cross-linguistically attested), the current sample will also include NPIs from different languages. Moreover, it is crucial that the sample of NPIs exhibits a typological pattern in terms of polarity strengths. Thus, the inclusion of NPIs of different strengths in the sample will allow us to understand the similarities and differences between the acquisitional patterns and the nature of NPIs when they do not follow the exact same distributional patterns.

On the basis of the above-presented arguments, three NPIs are selected as targets for investigation: Dutch *hoeven* 'need', English *any* and Mandarin Chinese *shenme* 'a/some'. An overview is given below.

¹ Relevant data are collected in the following subcorpora of the CHILDES database: BolKuiken (Bol and Kuiken 1990), CLPF (Fikkert 1994; Levelt 1994), Groningen (Wijnen and Bol 1993), and Wijnen (Elbers and Wijnen 1992; Wijnen 1988, 1992).

² Data collected in BolKuiken (Bol and Kuiken 1990), CLPF (Fikkert 1994; Levelt 1994), Groningen (Wijnen and Bol 1993), and Wijnen (Elbers and Wijnen 1992; Wijnen 1988, 1992) in the CHILDES database show that Dutch-acquiring children aged between approximately one and five years old – at least those recorded in the above-mentioned corpora – never use the NPI *mals*. I therefore assume that it is very unlikely that this NPI is acquired in early childhood.

NPI	Language	Category	Strength
<i>hoeven</i> 'need'	Dutch	Modal verb	Between strong and weak
<i>any</i>	English	Indefinite	Weak
<i>shenme</i> 'a/some'	Mandarin	Indefinite	Superweak

Table 1: The selected NPIs

Also important for the current research, child speech data of the three languages from which the NPIs are selected are readily available in the CHILDES database. They occur sufficiently frequently for analysis too.

Given the selected sample of NPIs, the employment of corpus and experimental studies will be useful in answering research question Q1 (what kind of learning mechanism(s) children may employ in their acquisition of NPIs) and Q2 (what kind of developmental patterns the acquisition of NPIs may exhibit). In order to explore the reasons and/or properties underlying NPI-hood and to further understand the nature of NPIs (namely research question Q3), I will investigate the analysis of each of the selected NPIs, emerged during the acquisitional process, which is established based on both corpus and experimental findings. This will be done by hypothesising an underlying analysis or representation of the NPIs based on their distributional patterns in late child language, but also by taking into consideration how the NPIs have developed into these distributions, given their distributional patterns attested in early child language.

5 Organisation of the dissertation

This dissertation is organised as follows. Chapter II will provide a more detailed discussion of why the existence of NPIs raises a learnability problem, and what possible learning strategies a learner can use to solve this problem. By focusing on the distribution of the Dutch NPI *hoeven* 'need' in child language use, Chapter II will show how a combination of a frequency-based learning approach and a conservative learning mechanism explains the acquisition of the modal NPI. Corpus results collected from the CHILDES database will give rise to two developmental stages in the acquisition of the Dutch NPI *hoeven*: an initial stage in which children utter *hoeven* in the scope of the sentential negative marker *niet* 'not' only, and a subsequent stage in which children also use negative indefinites such as *geen* 'no(ne)' or *niks* 'nothing' to license the NPI *hoeven*. In order to explain this developmental pattern, Chapter II will hypothesise that Dutch children start by analysing *hoeven* as bearing a lexical dependency with the sentential negative *niet* as [HOEVEN NIET] and reanalyse the NPI as being lexically associated with an abstract negation NEG as [HOEVEN NEG] shortly after the age of four.

Chapter III will continue to explore the acquisition of the Dutch NPI *hoeven*, but from an experimental perspective. This is because corpus studies restrict our understanding of language acquisition to merely

8 Acquiring Negative Polarity Items

production, which does not always equal the exact range of children's linguistic knowledge. Experimental data collected with 132 monolingual Dutch children (age range: 2;09–5;10; mean=4;04; SD=9.3 months) will not only confirm, but also fine-tune the developmental pattern attested in the corpus study presented in Chapter II. In particular, the early Dutch grammar consists of two lexical frames of the NPI *hoeven*, namely [HOEVEN NIET] and [HOEVEN GEEN], which are both triggered by frequent co-occurrence of the NPI with *niet* or *geen* in the language input; whereas the late Dutch grammar, on the other hand, contains merely one abstract analysis as [HOEVEN NEG].

Chapter IV investigates the learnability problem of the Mandarin NPI, i.e. *shenme* 'a/some', by means of a corpus study in the CHILDES database. Since the literature thus far does not provide a systematic and quantitative overview of how this Mandarin NPI is distributed in the language, this chapter will moreover investigate the distribution of *shenme* in naturalistic adult speech. Data collected in adult Mandarin will confirm that *shenme* is an NPI of a superweak strength, since it is attested – though most frequently in *wh*-questions – in the whole array of so-called *nonveridical* environments only. Data collected in child Mandarin will suggest two developmental stages in the acquisition of the NPI *shenme*. In the initial stage, children analyse *shenme* as a mere question word, which explains why younger children only use *shenme* in *wh*-questions, but not in other nonveridical environments. In the subsequent stage, which is shortly after the age of four, however, a reanalysis is made: children no longer consider *shenme* as a mere question word but rather as a superweak NPI, which survives in a variety of nonveridical contexts, including *wh*-questions. This reanalysis explains the wider distributional pattern of *shenme* attested in late child language than in early child Mandarin.

The acquisition of the Mandarin NPI is further explored in an elicited imitation task in Chapter V – based on the same argument as motivated for the experimental study presented in Chapter III. Data obtained from 88 monolingual Mandarin children (age range: 2;11–4;09; mean=3;11; SD=6 months) will be presented, which provide evidence for the corpus findings reported in Chapter IV. Specifically, Mandarin children start with the narrow assumption of *shenme* that it is merely a question word, and extend this narrow assumption by analysing *shenme* as an NPI of the superweak strength. Moreover, the experimental results will also suggest an earlier age of reanalysis than that hypothesised age based on the corpus findings reported in the previous chapter, namely even before the age of four.

After investigating the learnability problem of two NPIs in Chapter II to V, Chapter VI addresses the question of why NPIs are NPIs, by comparing the acquisitional patterns of the three NPIs sampled in the current dissertation: Dutch *hoeven*, English *any* and Mandarin *shenme*. The cross-linguistic investigation of the acquisition of different NPIs will lead to the conclusion that NPIs of different strengths have become NPIs due to very different reasons. This will be mainly supported by the fact that distinct learning pathways are attested in the acquisition of these different NPIs –

although the same conservative widening learning strategy turns out to be responsible for the acquisition of all the three NPIs. In particular, Dutch *hoeven* 'need' has become an NPI because it bears a lexical dependency with an abstract negation NEG; English *any* gains its polarity sensitivity since it must be obligatorily exhaustified; and Mandarin *shenme* 'a/some' has become an NPI due to its referential deficiency.

Finally, Chapter VII concludes the dissertation and will provide answers to the research questions. In this chapter, I will summarise the learning patterns attested in the acquisition of different NPIs selected in this dissertation, and illustrate a learning mechanism underlying all attested acquisitional patterns. I will conclude with a number of theoretical implications for different approaches to the *licensee* questions of NPIs from the perspective of language acquisition.

10 Acquiring Negative Polarity Items

Chapter II

Emerging NPIs: the acquisition of Dutch *hoeven* 'need'

Abstract

Dutch modal verb *hoeven* 'need' is a Negative Polarity Item (NPI) because of its restricted distribution to certain negative contexts only. By investigating the distribution of this NPI in child Dutch, the paper explores a solution to a learnability problem raised by the existence of NPIs: how can a child acquire the limited distribution of an NPI in the absence of both direct and indirect negative evidence? Corpus data collected through CHILDES confirm children's employment of a conservative widening learning strategy to solve the learnability problem. This strategy entails that children start out with the strictest assumption of *hoeven*, exhibiting a lexical dependency with the negative marker *niet* 'not', and weaken the assumption down to a less rigid reanalysis of this NPI, associated with an abstract negation in its underlying syntactic representation. The initial learning process turns out to be distribution-based only, i.e. without presuming any innate knowledge of NPIs and their restricted occurrences. However, distributional properties alone are not sufficient for children to reanalyse the NPI. Children's linguistic knowledge of negative indefinites as exhibiting a decomposable negation plays a crucial role in the subsequent reanalysing process. The reanalysis emerging shortly after age four signifies exactly how adult speakers analyse the NPI, also explaining *hoeven*'s strength as a polarity item.

1 Introduction

Negative Polarity Items (NPIs) are lexical items that can only survive in certain kinds of negative contexts (see Ladusaw 1979; McCawley 1988; etc.). Dutch modal verb *hoeven* 'need' is an NPI (Hoeksema 1997, 2000; Van der Wouden 1997; Zwarts 1981, 1986, 1998). This is shown in examples below, in which *hoeven* is only grammatical under the scope of the sentential negative marker *niet* 'not' in (1), or negative indefinite *geen* 'no(ne)' or *niets* 'nothing' in (2), or semi-negative expressions such as *nauwelijks* 'seldom' in (3a) and exclusive adverbs like *alleen* 'only' in (3b).¹

* This chapter is adapted from Lin, Jing, Fred Weerman, and Hedde Zeijlstra. (2015). Emerging NPIs: the acquisition of Dutch *hoeven* 'need'. *The Linguistic Review* 32(2):333-374.

¹ For a systematic representation of *hoeven*'s distribution in Dutch as an NPI, the reader is referred to Section 6.

12 Acquiring Negative Polarity Items

- (1) Wij hoeven vandaag *(niet) te werken.
we need today not to work
'We do not have to work today.'
- (2) a. Geen/*Een arts hoeft vandaag te werken.
no/a doctor needs today to work
'No doctor has to work today.'
b. Jan hoeft niets/*iets voor zijn dochter te kopen.
John needs nothing/something for his daughter to buy
Lit.: 'John has to buy nothing for his daughter.'
'John does not have to buy anything for his daughter.'
- (3) a. Jan hoeft *(nauwelijks) te koken.
John needs seldom to cook
'John seldom has to cook.'
b. Jan hoeft *(alleen) in het weekend te koken.
John needs only on the weekend to cook.
'John only has to cook on the weekends.'

NPIs form a cross-linguistic phenomenon (Haspelmath 1997; Horn 1989), and may vary cross- and intra-linguistically in strength depending on the types of negative contexts that may license them (Hoeksema 2000; Nam 1994; Van der Wouden 1997; Zwarts 1986, 1995). Since the ungrammaticality of an NPI in non-licensing contexts is not necessarily inferred by the absence of such constructions in the input, the existence of NPIs raises an important problem for language learners. How can children detect an NPI's restricted distribution in the absence of substantial or reliable negative feedback? The fact that NPIs vary in their strengths makes the learnability problem even more complex: how and why are language learners able to acquire, in the absence of negative evidence, exactly which types of contexts can and cannot license an NPI? Although from the perspective of learnability (Chomsky 1972; 1975, 1981; Gold 1967; Goldsmith 1976, 1980; Pinker 1979; among others) the existence of NPIs poses hard problems, surprisingly little research has been done on this topic. To the best of our knowledge, the only existing work on the topic is limited to Dutch NPIs *hoeven* 'need' and *meer* 'more' in Van der Wal (1996), English NPI *any* in Tieu (2010, 2011) and Mandarin NPI *shenme* 'a/some' in Lin (2011a), Lin and Zeijlstra (2012).²

² Drenhaus et al. (2005), Drenhaus et al. (2006a, 2006b), Pablos et al. (2011), Saddy et al. (2004), Schutte (2006) and Xiang et al. (2009) investigate how the participants – both adults and children – process grammatically and ungrammatically used NPIs in Basque, English, German and Greeks. However, none of these studies focuses on the acquisition of NPIs by language acquiring children and the learnability problem remains unaddressed.

In order to solve the learnability problem, the current study explores the acquisition of the NPI *hoeven* by analysing spontaneous speech data of 53 monolingual Dutch children. The paper shows that the learnability problem can only be circumvented once a *conservative widening learning strategy* is adopted. We provide evidence for the following acquisitional process. First, children start out with a strict constructional analysis of the target NPI (in this case: *hoeven*). This is based on positive evidence that *hoeven* has a lexical dependency with the negative marker *niet*. In the subsequent stage, children extend this initial assumption according to language input and reanalyse *hoeven* as lexically associated with an abstract semantic negation NEG in its underlying syntactic representation. Moreover, we show that this reanalysis turns out to be the adult analysis of the target NPI and consequently explains why *hoeven* is a relatively strong NPI.

The paper first outlines the learnability problem in Section 2. Then, in Section 3, it illustrates the conservative widening learning hypothesis and motivates three predictions for the development of child Dutch. Section 4 introduces the methodology and Section 5 presents our research results. In Section 6, we provide an explanation for the attested acquisitional pathway of the NPI. Section 7 compares our approach with two alternative explanations: Van der Wal's approach (1996) and a lexical approach following Mintz et al. (2002) and Mintz (2002, 2003). Section 8 concludes the paper and presents suggestions for further research.

2 The learnability problem

NPIs such as *hoeven* exhibit a restricted distribution to certain negative contexts only (see (1) to (3)). This suggests that children, in order to achieve the target analysis of an NPI, must obtain the knowledge of not only exactly which types of negative contexts can license it but also in exactly which types of negative contexts it is not allowed to appear. Acquisition of possible licensing contexts for an NPI is easily supported by the presence of positive evidence. This is because positive evidence refers to input data containing grammatical constructions in the target language (Pinker 1995) that is reliable and available to all language learners in all developmental stages (Marcus 1993; Pinker 1984, 2013; among others). On the contrary, to acquire the knowledge of what are impossible licensing contexts for *hoeven* appears to be problematic: the absence of unlicensed NPIs in the input does not necessarily indicate any ungrammaticality. In such a situation, we would expect children to be systematically confronted with explicit information on the ungrammaticality of unlicensed NPIs, i.e. direct negative evidence (Baker and McCarthy 1981; Marcus 1993; among others). However, as is widely argued, children acquire language solely from positive evidence (Baker and McCarthy 1981; Berwick 1985; Braine 1971; Chomsky and Lasnik 1977; Manzini and Wexler 1987; Marcus 1993; Marcus et al. 1992;

14 Acquiring Negative Polarity Items

Grimshaw 1981; Gropen et al. 1991; Pinker 1984, 1995, 2013). Negative evidence, such as corrective feedback from parents, or an explicit denial of a child's ungrammatical utterance, is either absent (Boyd and Goldberg 2011; Braine 1971; Brown and Hanlon 1970; Cowie 1997; Goldberg 2011; Gropen et al. 1991; Marcus 1993; Marcus et al. 1992; Pinker 1984, 1995, 2013; among others),³ or "(mercifully) uncommon" (Boyd and Goldberg 2011: 56). Marcus (1993) also claims that negative evidence is not reliable as it is not of sufficient quantity and quality; neither is it available for all language learners in all acquisitional stages for all types of ungrammatical errors.⁴ Moreover, language learners do not seem to benefit from corrective feedback, even if there is any (Boyd and Goldberg 2011; MacWhinney 2002; McNeill 1966; Stromswold 1994; among others). In the absence of substantial and influential negative evidence, overgeneralisation errors appear to be unavoidable (Braine 1971; Gold 1967; Pinker 1979, 1995, 2013). Children are therefore expected to overuse NPIs in non-licensing environments. But if overgeneralisation errors indeed occur, how are children supposed to unlearn these errors in the absence of influential systematic corrective feedback or explicit information on unlicensed NPIs?

One possible mechanism that may help language learners to recover from overgeneralisations is that of *statistical pre-emption*. This learning mechanism does not require language learners to be able to benefit from direct negative evidence, since it only relies on indirect negative evidence (Bates and MacWhinney 1987; Boyd and Goldberg 2011; Clark 1987; Foraker and McElree 2007; Goldberg 1993, 1995, 2006, 2009, 2011; Marcotte 2005;). Indirect negative evidence (cf. Chomsky 1981) refers to information about which constructions or forms are absent from the language input, and is a third type of evidence in language acquisition, in addition to positive evidence and direct negative evidence. In order to benefit from indirect negative evidence, language learners must make the following inference: X is not part of the target language if X is absent from the input. For instance, every time English children (would like to) use **asleep cats*, they hear a semantically and pragmatically related alternative construction *sleeping cats* in the input. By their employment of indirect negative evidence, children can eventually establish a rule that the adjective *asleep* cannot be attributively used according to the target grammar. Contrary to direct

³ See also MacWhinney (2002) for a review of the literature in this respect.

⁴ See a related discussion in Marcus (1993) on the affectedness of different types of corrective feedback in the input on children's acquisition of the target language. Actually, the only possible form of corrective feedback in a process of language acquisition is what Marcus (1993) terms "the noisy feedback", i.e. "certain discourse patterns that differ in frequency depending on the grammaticality of children's utterances" (Marcus 1993: 53). However, as the author argues, such feedback is too unreliable and unsystematic to have any influence on children's acquisition of the knowledge of what is ungrammatical in their target grammar (see also Boyd and Goldberg 2011, among others).

negative evidence, indirect negative evidence is reliable and available to language learners regardless of their age or the type of grammatical phenomena (cf. Marcus 1993). This suggests that the absence of **asleep cats* in the input can function as a cue for the ungrammaticality of attributively used *asleep* in adult English. The presence of *sleeping cats* preempts therefore the overused **asleep cats*. The mechanism of statistical pre-emption requires two conditions. The first is the obligatory existence of the alternative form in the input, i.e. *sleeping cats* in this example; and the second is that the frequency of this alternative is much more than zero whereas that of the overused form, i.e. **asleep cats*, is always zero.

The statistical mechanism could explain how children can unlearn overgeneralisation errors at both the syntactic and morpho-syntactic level (see Boyed and Goldberg 2011 for an overview of related literature). Nevertheless, this mechanism cannot account for how children could ever recover from their overgeneralisation errors of NPIs, since the first condition required by statistical pre-emption would never be satisfied in such cases. For instance, Dutch does not seem to exhibit a semantically or pragmatically alternative form of *hoeven* in a complementary distribution. At first sight, the Positive Polarity Item (hereafter PPI) *moeten* ‘must’ (cf. Iatridou and Zeijlstra 2010) may appear to be such an alternative modal, pre-empting the NPI *hoeven*; but there are contexts in Dutch that may even license both the NPI and the PPI: under the scope of an exclusive adverb in (4) and a quasi-negative expression in (5).⁵

⁵ The absence of any semantically or pragmatically related alternative forms of NPIs is not restricted to Dutch. English NPIs lack pre-empting forms as well because there are contexts in English that may allow both NPIs and non-NPIs to appear. This is illustrated in the examples below, in which NPIs are marked in bold.

- (i) Everyone who wants to have **any**/some/∅ coffee should go to the front desk.
- (ii) Has John finished **yet**/already?
- (iii) If you **ever**/sometimes feel sad, you can even call me at work.

Similar observations are also made for Mandarin NPI *shenme* ‘a (thing)’, as both the NPI indefinite and its plain counterpart *yi ben* ‘one-CL’ can survive in the following contexts. Bare NPs are also allowed in these contexts.

- (iv) Yuehan **shenme**/yi ben/∅ shu dou mei mai.
John *shenme*/one-CL/∅ book all not buy
‘John did not buy any book(s) at all.’
- (v) Yuehan zai kan **shenme**/yi ben/∅ shu ma?
John at read *shenme*/one-CL/∅ book Q-marker
‘Is John reading (a/some/any) book(s)?’
- (vi) Yuehan haoxiang zai kan **shenme**/yi ben/∅ shu.
John probably at read *shenme*/one-CL/∅ book
‘John is probably reading (a/some) book(s).’

16 Acquiring Negative Polarity Items

- (4) a. Alleen Jan hoeft te rijden.
only John needs to ride
'Only John has to drive.'
- b. Alleen Jan moet rijden.
only John must ride
'Only John has to drive.'
- (5) a. Niet iedereen hoeft naar de WC te gaan.
not everybody needs to the toilet to go
'Not everybody has to go to the toilet.'
- b. Niet iedereen moet naar de WC gaan.
not everybody must to the toilet go
'Not everybody has to go to the toilet.'

Examples in (4) and (5) clearly show that in the particular case of the acquisition of NPIs, indirect negative evidence is absent as well. However, as pointed out by one of the reviewers, language learners might still be able to appropriately restrict the distribution of two items by performing (a form of) statistical pre-emption, because they can sometimes tease apart environments in which the two items are truly complementary from those in which they are non-complementary. A case in point could be the English *some-any* dichotomy, which allows distributional overlap between the two in the same contexts where both *hoeven* and *moeten* can occur. Nevertheless, children cannot depend on an alternative item of a modal NPI to detract from their overuse of the NPI – whether or not this NPI has a truly complementary distribution with an alternative PPI – because Dutch NPI *hoeven* is not the only modal verb that necessarily takes scope under negation. As observed by Iatridou and Zeijlstra (2013), among others, all polarity-insensitive modal verbs take scope under negation as well. On the other hand, the PPI modal *moeten* always has a wide scope over negation (see, e.g. Iatridou and Zeijlstra 2013). If children would indeed rely on the existence of the PPI *moeten* to acquire the target modal *hoeven*, then it would suffice for them to assume that *hoeven* is a polarity-insensitive modal instead of an NPI modal. In fact, several languages exhibit a universal PPI modal next to a polarity-insensitive one. For instance, Greek *prepi* 'must' is a PPI, but its dual *chriazete* 'have to' is polarity neutral. This means that NPIs cannot be acquired solely by relying on their counterpart PPIs. Consequently, a statistical learning mechanism, such as *the (Constrained) Statistical Learning Hypothesis* (Romberg and Saffran 2010; Saffran 2002, 2003; Thiessen 2011) cannot provide a proper explanation for how language learners are supposed to unlearn overused NPIs in the absence of direct negative evidence.

The literature so far also provides other possible strategies that explain why in an actual process of language acquisition children can sometimes recover from disastrous overgeneralisation errors – even in the absence of direct negative evidence. These strategies, being either learned or innate, concern “a general pragmatic mechanism or a linguistic specific

mechanism” (Marcus 1993: 55) (see also Braine 1971). One example is a universal linking rule called *object affectedness* (Gropen et al. 1991) that links the argument specified as having a certain theta-role in a verb’s semantic representation to the grammatical object. As discussed in Gropen et al. (1991), this universal linking rule explains how English children can unlearn their own erroneous constructions (see also Marcus 1993 and Pinker 2013). For example, in an utterance as **I filled water into the glass*, children overgeneralise the argument structure of *pour*, as in *I poured water into the glass*. However, they unlearn the overgeneralisation once positive evidence leads them to acquire the correct semantic representation of the verb *fill*. Another example of internal mechanisms is a hypothesis of *inflectional blocking* (Marcus et al. 1992), also known as the *unique entry* principle in Pinker (1984). This hypothesis explains how children are able to unlearn overused regular morphemes to irregular word stems, just like overgeneralisation errors of the regular past tense morpheme *-ed* to irregular verbs in English, resulting in erroneous forms such as **go-ed*, or even **went-ed* and **make-d* (see also Clark 1995; Marcus 1993; Pinker 2013).

The two examples outlined above represent children’s overgeneralisation errors at the interface between (word) semantics and syntax (Boyed and Goldberg 2011; Goldberg 2011; Gropen et al. 1991; Marcus 1993; Pinker 2013; among others) and at the morpho-syntactic level (Bowerman 1982; Clark 1987, 1995; Marcus 1993; Pinker 1984, 1995; among others). Although both the universal linking rule and the inflectional blocking hypothesis are, naturally, too specific to apply to the particular case of overgeneralisation of NPIs, we do not see how a more general mechanism in the same spirit could do so either.

So far, we have elaborated the learnability problem of NPIs and argued why language learners appear to suffer from overused NPIs that cannot be unlearned in the absence of both direct and indirect negative evidence. Since every typically developing child successfully acquires his/her first language, however, the learnability problem described here must be solvable. By focusing on the Dutch NPI *hoeven*, this paper explores a solution to the learnability problem of NPIs in general.

3 Hypothesis and predictions

The learnability problem of NPIs due to the absence of negative evidence can only be solved once a learning model is adopted that relies on positive evidence only. One possible learning strategy in this respect is *conservative widening* (after Van der Wal 1996; see also Koster and Van der Wal 1996; Manzini and Wexler 1987; Snyder 2008; Tieu 2010, 2011;). Conservative widening is a general learning mechanism hypothesised for language acquisition that can be best defined in terms of the Subset Principle (Manzini and Wexler 1987): “Briefly, the subset principle demands that a learning

18 Acquiring Negative Polarity Items

procedure should guess the narrowest possible language, consistent with positive evidence seen so far. By hypothesizing as narrow a target language as possible, the acquisition procedure is protected from disastrous overgeneralisation” (Berwick and Weinberg 1986: 233). Although a conservative widening learning mechanism can prevent children from making overgeneralisation errors, the question is how children are supposed to make the first step in analysing an NPI. Instead of assuming any innate linguistic knowledge, we take children’s establishment of their initial analysis to be input-based only in a similar way as proposed for category learning via a *distributional approach* (Cartwright and Brent 1997; Mintz 2002; Mintz et al. 2002; Redington et al. 1998). We adopt Mintz (2002, 2003) and Mintz et al. (2002) in that a *distribution-based* learning mechanism plays a crucial role in early language acquisition. In the absence of innate knowledge about NPI-hood, children’s first attempt to analyse a target NPI can only be guided by investigating positive evidence available in the beginning of acquisition in terms of distributional properties.

The hypothesis discussed above predicts the acquisition of NPIs to exhibit several developmental stages. Children start with the strictest possible analysis of their target language, based on distributional properties of that limited input data available in the acquisitional onset. This analysis may not be identical to that of an adult speaker, but it is at least compatible with all the input data a child has perceived and analysed so far. However, such a rigid analysis can be easily falsified by more input data processed in a succeeding stage.⁶ This can eventually lead language learners to weaken down the initial analysis to construct a reanalysis explaining the input data perceived and processed in both stages. Such an iterative process continues until at a certain stage of language acquisition children may establish an analysis that explains all input data throughout the whole process of language development. This conservatively widening pathway in acquisition, as schematically illustrated below, can be best described by the Subset Principle: the set of the output of an analysis at a certain stage is always a subset of the set of the output generated by its reanalysis in the subsequent stage.

⁶ The question may now arise as to why children in an earlier stage ignore these falsifying data. We do not assume that the quality or quantity of the input changes over time, but rather that the amount of input evidence that language learners are able to process and analyse in an initial stage is more limited. This may be a consequence of children’s small capacity of processing and analysing input data, which improves over the course of language development; it may also be the case that it takes time for children to collect sufficient frequency data to falsify an initial analysis.

Stage 1:	limited input data available in the onset	→ initial analysis A1
Stage 2:	input data that falsify A1	→ reanalysis of A1: A2
Stage 3:	input data that falsify A2	→ reanalysis of A2: A3
...
Stage n:	input data that falsify A(N-1)	→ reanalysis of A(N-1): AN=ATARGET

Table 1: An acquisitional process under the hypothesis of conservative widening

The hypothetical acquisitional process illustrated in Table 1 leads to three predictions for the distribution of *hoeven* in child Dutch development.

First, we expect children not to overgeneralise the NPI in non-licensing conditions in any developmental stage. The conservative widening strategy relies merely on positive evidence. Consequently, it is impossible for children to produce utterances of overused *hoeven* as such utterances are absent in the language input.

Second, we predict the distribution of *hoeven* to be more restricted in early than in late child Dutch. This is because the set of the output of *hoeven*'s analysis is a subset of the set of the output of its reanalysis in a subsequent stage, as illustrated in Table 1.

Third, since we do not assume any inherent awareness of *hoeven* being an NPI, contrary to Van der Wal (1996) as will be discussed in Section 7, we expect *hoeven*'s distributional pattern in the input to be important in children's first attempt to analyse the NPI. Following Mintz (2002, 2003) and Mintz et al. (2002), our last prediction is that *hoeven* in early child Dutch is restricted only to the type(s) of negative contexts that is/are most frequently attested as its licenser(s) in child-directed speech.

4 Methodology

In order to examine the three predictions from the perspective of a conservative widening learning strategy, we conducted a corpus study in the CHILDES database (MacWhinney 2009), in which spontaneous speech data of Dutch children in the following subcorpora were investigated: *BolKuiken* (Bol and Kuiken 1990),⁷ *CLPF* (Fikkert 1994; Levelt 1994), *Groningen* (Wijnen and Bol 1993), *VanKampen* (Van Kampen 1994) and *Wijnen* (Elbers and Wijnen 1992; Wijnen 1988, 1992). Altogether, 633 CHAT files of 53 monolingual Dutch children between the ages of one and five were analysed. Because only two of these children were longitudinally recorded throughout the period of investigation, i.e. Sarah and Laura in *VanKampen*

⁷ Only typically developing children recorded in this subcorpus were included.

20 Acquiring Negative Polarity Items

(Van Kampen 1994), we opted for a cross-sectional analysis. To provide an overview of the distribution of *hoeven* in child Dutch development, three stages were divided based on the biological age of the child at the moment of recording: Stage I (age: 1-3), Stage II (age: 3-4) and Stage III (age: 4-5).⁸

The exact procedure of the investigation is as follows. The frequency of the target NPI in three inflected forms of the present tense and its infinitive form was first counted by employing the freq-command of the CLAN program in CLAN CHAT files, namely *hoef* (HOEVEN-1SG), *hoeft* (HOEVEN-2/3SG) and *hoeven* (HOEVEN-PL/INF). Subsequently, each utterance containing *hoeven* was analysed for both its licensing status and licensing condition by using the kwal-command. Generally, three lines of context preceding and following an utterance of *hoeven* were analysed as well by adding "+w3" and "-w3" to the command. If a total of six lines of context were not sufficient to evaluate *hoeven*'s licensing status and licensing condition, more contextual data was checked manually.

5 Results and analysis

Children's utterances containing the target NPI were divided into three categories depending on licensing status, i.e. the category of *adult-like*, *non-adult-like* and *unclear situation*. The adult-like category contained utterances of *hoeven* that are also commonly produced by Dutch adult speakers. *Hoeven* in such utterances was either *linguistically licensed* by a proper linguistic licenser, such as the negative quantifier *geen* 'no(ne)' in (6); or *pragmatically licensed*, for instance, in a contrastive context marked by *wel* 'indeed' as in (7). *Hoeven* could also be substituted by a non-NPI modal verb by means of *self-correction*, like by the PPI *moeten* 'must' in (8) (Homer 2011; Iatridou and Zeijlstra 2010, 2013).

⁸ The current study chose the chronological age at recording as an indication of different developmental stages. Alternatively, as proposed by one of the reviewers, Dutch children's development of negation may also indicate different stages in the acquisition of NPIs. However, a potential difficulty of using the development of negation as an indicator is that children's production (of negation) does not always equal their knowledge (of negation). Another alternative would be to use the Mean Length of Utterance (MLU) in either morphemes or words to benchmark children's acquisitional stages. MLU in either morphemes or words is a useful tool for distinguishing atypically developing children from their typically developing counterparts (see, e.g. Bishop and Adams 1990; Nippold 1990; Nippold and Schwarz 2002) or to indicate language proficiency of children in relatively early language development, i.e. before approximately age four (Leonard 2000, among others). Since all our participants were typically developing children up to the age of five, we did not employ MLU in either morphemes or words in the current study.

- (6) xx hoef geen suiker.
 xx need no sugar
 ‘xx does not need sugar.’
 (Wijnen and Bol 1993: abe21000.cha: line 24)
- (7) Nee, hoeft wel.
 no needs surely
 ‘No, it *is* necessary.’
 (Wijnen and Bol 1993: mat30603.cha: line 1467)
- (8) Deze hoe(ft) deze moet ə op.
 this need(s) this should ə on
 ‘This needs, this should be here.’
 (Wijnen and Bol 1993: daa20910.cha: line 436)

At first sight, utterances such as (7) and (8) differ from the distribution of the NPI introduced in Section 1 (consider again examples (1) to (3)); however, this is only apparent. The category of adult-like does not only include grammatically licensed *hoeven* but also all child utterances of *hoeven* that are found in adult Dutch as well. Expression (7) is counted as pragmatically licensed and falls under adult-like because Dutch adults sometimes produce such utterances under a contrastive context to deny a preceding utterance, such as *Dat hoeft niet* ‘That is not necessary’. Data of adult Dutch collected in *het Corpus Gesproken Nederlands* ‘the Spoken Dutch Corpus’, Oostdijk 2004, hereafter the CGN) also show that Dutch speakers indeed utter such instances containing *hoeven* appearing under a contrastive focus marked by *wel* ‘surely’ (see Appendix A).⁹ The same line of reasoning applies to utterances such as (8).¹⁰

On the other hand, child utterances of *hoeven*, unlike those of adult Dutch speakers, fell under the category of non-adult-like; but because these utterances may differ from their adult-like counterparts for different reasons, we further divided children’s utterances containing non-adult-like *hoeven* into three subcategories. This allowed us to examine the exact nature of the non-adult-likeness.¹¹ The subcategory *licensed by pseudo-licensors* refers to

⁹ Data of adult Dutch were collected from *Component a* “Spontaneous conversations ‘face-to-face’”, *Component c* “Spontaneous telephone dialogues (recorded via a switchboard)” and *Component d* “Spontaneous telephone dialogues (recorded on MD via a local interface)” of the CGN (Oostdijk 2004).

¹⁰ As one of the reviewers correctly pointed out, we were not able to judge whether *hoeven* would have been licensed in case of self-correction. The crucial point for us for analysing self-correction as adult-like is that this is also something that Dutch adults do (see Appendix A).

¹¹ Other types of non-adult-likeness, such as at syntactic level (e.g. ungrammatical word orders), at morpho-syntactic level (e.g. ungrammatical verbal inflection), at lexical level (e.g. *waf waf* instead of *hond(je)* ‘dog(gy)’),

22 Acquiring Negative Polarity Items

those utterances containing a linguistically legal licenser that was not phonologically realised in a proper adult-like way, such as in (9) in which the anaphoric negation *nee* is uttered instead of the required *geen* 'no(ne)'.¹² When a linguistically legal licenser of *hoeven* was only contextually present, by means of incorrect ellipsis as given in (10), it counted as *licensed by contextual present licenser*.¹³ Finally, the subcategory of *not licensed* covered *hoeven*'s occurrences in the absence of any linguistic legal licenser and/or a proper pragmatic context as illustrated in (11).

(9) Ik hoef pit in (.) nee.
I need seed inside no
Lit.: 'I need a seed inside no.'
'I don't need a seed inside.'
(Wijnen and Bol 1993: mat20926.cha: line 654)

(10) Deze hoef ik niet . deze hoef ik ook.
this need I not this need I also
'I do not need this one, and this one neither.'
(Van Kampen 1994: sarah26.cha: line 363)

(11) Ik hoef drinken.
I need drink
'I want to drink something.'
(Wijnen and Bol 1993: mat30113.cha: line 515)

If, after taking the linguistic environment and available contextual information into account, it was still impossible to analyse *hoeven*'s licensing status, an instance of unclear situation was counted. An example of such a case is in (12), where an incomplete utterance is concerned.

(12) (l)k hoef ...
I need
'I need ...'
(Wijnen and Bol 1993: jos30110.cha: line 1275)

This categorisation of children's use of NPI's leads to the results in Table 2.

blaan blaen instead of *banaan* 'banana'), are all disregarded in the current research.

¹² This type of non-adult like licensing of *hoeven* is also mentioned in Van der Wal (1996). We will come back to this point after presenting Table 2.

¹³ Utterance (10) is analysed as an instance of non-adult-like because such ungrammatical ellipsis was not found in adult data collected in the CGN and it was rejected by two Dutch informants.

Category	Subcategory	Stage I age: 1-3	Stage II age: 3-4	Stage III age: 4-5
Adult-like	Linguistically licensed	102 (87.18%)	68 (83.95%)	49 (96.08%)
	Pragmatically licensed	5 (4.27%)	4 (4.94%)	0
	Self-correction	2 (1.71%)	1 (1.23%)	1 (1.96%)
Total adult-like		109 (93.16%)	73 (90.12%)	50 (98.04%)
Non- adult-like	Licensed by pseudo licensors	1 (0.85%)	0	0
	Licensed by contextually present negation	3 (2.56%)	2 (2.47%)	0
	Not licensed	1 (0.85%)	1 (1.23%)	0
Total non-adult-like		5 (4.27%)	3 (3.7%)	0
Unclear situations		3 (2.56%)	4 (4.94%)	1 (1.96%)
Total		117	81	51

Table 2: Distribution of *hoeven* in child Dutch by licensing status

In each developmental stage, the percentage of adult-like utterances of *hoeven* exceeded 90% of the total amount. However, in order to examine the first prediction motivated in Section 3 (the absence of overgeneralisation errors), we should further analyse the category of non-adult-like utterances of *hoeven*, although the percentage of this category is less than 5% in Stage I and II, and even zero in Stage III.

In the case of licensed by pseudo-licensors, i.e. 0.85% in Stage I, zero percent in both Stage II and III, children employed head-shaking, anaphoric negation *nee* (or under-articulated *nə* or *ə*), or intonation contour to express semantic negation, although a properly phonologically realised negative marker was absent (see also Van der Wal 1996). Children's employment of a pseudo-licensor provides evidence for their awareness of *hoeven*'s sensitivity to the negative polarity of an utterance; therefore *hoeven* licensed by a pseudo-licensor cannot be taken to represent any overgeneralisation errors. *Hoeven* licensed by a negation that was only present in discourse context cannot be considered an overgeneralisation error either. This is because the contextually present negation indicates children's awareness of some restriction of *hoeven* as well. The subcategory of not licensed, finally, might identify children's overgeneralisation errors. However, since the percentage of this subcategory throughout the whole development of child Dutch was extremely marginal, i.e. 0.85% in Stage I, 1.23% in Stage II and zero percent in Stage III, we interpret the subcategory

24 Acquiring Negative Polarity Items

of not licensed to represent children's performance errors only.¹⁴ Hence, the first prediction is confirmed: Dutch children do not overuse the NPI in non-licensing contexts in any developmental stage.

As for the second and the third prediction, we further analyse all children's adult-like utterances containing linguistically licensed *hoeven* depending on the type of its licensing contexts. Adopting a standard classification of different types of negative expressions argued to play a role in NPI licensing (Van der Wouden 1997; Zwarts 1986, 1998), we distinguish three types of licensing conditions for the target NPI. If *hoeven* occurred under the scope of the negative marker *niet* as in (13), then it counted as an instance of *sentential negation* licensing. Licensed by a negative quantifier, such as *niks* 'nothing' in (14a) and *geen* 'no(ne)' in (14b), then it was counted as an instance of *hoeven* licensed by *negative indefinites*. If a form of negation weaker than *niet* or negative indefinites licensed *hoeven*, such as *alleen* 'only' in (15), it was counted as an instance of *weaker negation* licensing. Results following from this further analysis are presented in Table 3.

(13) Nee, ik hoeft niet naar de wc.
no I need not to the toilet
'No, I do not have to go to the bathroom.'
(Wijnen and Bol 1993: abe30308.cha: line 928)

(14) a. xxx hoeft niks van.
xxx need nothing from
Lit.: 'xxx needs nothing.'
'(I) do not need any of that (chocolate milk).'

b. xx hoeft geen suiker.
xx need no sugar
Lit.: 'xx needs no sugar.'
'(I) do not need any sugar.'
(Wijnen and Bol 1993: abe21000.cha: line 24)

(15) Alleen hoeft je zo te doen.
only need you so to do
'You only have to do so.'
(Van Kampen 1994: sarah44.cha: line 271)

¹⁴ Since the subcategory of *unclear situations* refer to children's utterances in which the licensing status of *hoeven* was impossible to categorise depending on both the linguistic environment and available contextual information, this category can hardly represent children's genuine erroneous use of the NPI. However, even if we were to assume the utterances of this subcategory all contained unlicensed *hoeven*, the percentage of the subcategory of *not licensed* would still be too low to represent systematic overgeneralisation errors.

Licensing condition	Stage I (age: 1-3)	Stage II (age: 3-4)	Stage III (age: 4-5)
Sentential negation (<i>niet</i> 'not')	101 (99.02%)	67 (98.53%)	42 (85.71%)
Negative indefinites (<i>geen</i> 'no(ne)', <i>niks</i> 'nothing', etc.)	1 (0.98%)	0	5 (10.2%)
Weaker negation (<i>alleen</i> 'only', <i>weinig</i> 'few', etc.)	0	1 (1.47%)	2 (4.08%)
Total	102	68	49

Table 3: Distribution of *hoeven* in child Dutch by licensing condition

Whereas the distribution of *hoeven* across different types of negative contexts in Stage I does not significantly differ from its distribution in Stage II ($p=.638$, $>\alpha=.01$, $df=2$), we do find a significant difference between children younger than four years old and their older counterparts in Stage III ($p=.001$, $<\alpha=.01$, $df=2$). Moreover, we find that the contributor to this significant effect is the emergence of negative indefinites as a *new* type of licensers for *hoeven* in Stage III (Std. Residual: -1.7 and 3.2 at $\alpha=.01$ before and after the age of four, respectively). This means that children in Stage III employ significantly more types of negative contexts to license the target NPI compared to children below the age of four. Therefore we confirm the second prediction that the distribution of *hoeven* is more restricted in early than in late child Dutch.

The corpus results discussed so far can also be represented in Figure 1. As this figure shows, the acquisition of *hoeven* exhibits two distinctive developmental periods with the age of four as a watershed. Focusing first on *hoeven*'s distribution in early child Dutch, we find that this NPI is always attested under the scope of the sentential negative marker *niet*; on the other hand, in late child Dutch, the NPI is allowed in (at least) negative contexts introduced by a negative indefinite as well.¹⁵ That *hoeven* in early child Dutch can apparently only be licensed by *niet* is exactly what we expected, since the negative marker *niet* turns out to be the most frequent licenser of *hoeven* attested in child-directed speech, occurring 80.81% of the time (see Appendix B).¹⁶ Thus, the distribution of *hoeven* is restricted to negative contexts introduced by *niet* in a child's initial analysis,

¹⁵ In the current study, early child Dutch refers to the developmental period before the age of four; late child Dutch represents the period after the age of four but before the age of five since the corpus research only covers Dutch children between one and five years old.

¹⁶ Data concerning *hoeven*'s distribution in child-directed speech are collected from the following subcorpora of the CHIDLES database (MacWhinney 2009): *BolKuiken* (Bol and Kuiken 1990), *Groningen* (Wijnen and Bol 1993), *VanKampen* (Van Kampen 1994) and *Wijnen* (Elbers and Wijnen 1992; Wijnen 1988, 1992). Only utterances containing linguistically licensed *hoeven* were taken into account.

26 Acquiring Negative Polarity Items

but this distribution is expanded later on. This is completely in line with our last prediction motivated in Section 3. Given the massive co-occurrence of *hoeven* and *niet* within the same clause, Dutch children only produce utterances of the NPI under the scope of *niet* in early stages.

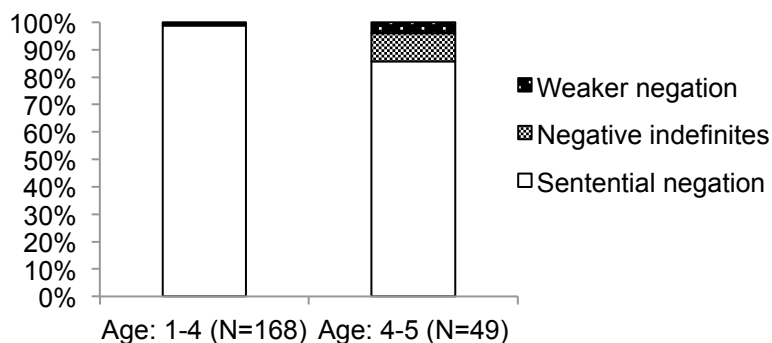


Figure 1: Developmental pathway in the acquisition of *hoeven*

With all three predictions confirmed, we conclude that Dutch children indeed employ a conservative widening learning strategy in their acquisition of the target NPI. This conservative strategy explains how and why children are able to detect a restricted distribution of an NPI to certain negative contexts only – even in the absence of both direct and indirect negative evidence. But how exactly does this hypothesis explain the developmental pathway illustrated in Figure 1? This question is addressed in the following section.

6 Explaining the acquisitional pathway

As shown in Section 5, the acquisition of the NPI *hoeven* exhibits two stages. In the first stage, Dutch children only allow the target NPI to appear under the scope of the negative marker *niet*. In the subsequent stage, Dutch children also utter *hoeven* in negative contexts introduced by negative indefinites, such as *geen* and *niks*. Here we take these two developmental stages in the acquisition of *hoeven* to represent two distinct analyses of this NPI by Dutch children of different ages, in particular an initial analysis A1 in early child Dutch and a reanalysis A2 in late child Dutch. Under the hypothesis of conservative widening, A1 and A2 must satisfy the following requirements. First, both A1 and A2 should be triggered by positive evidence. Second, A1 should be more rigid than A2 due to an extending, weakening-down process in acquisition predicted by the conservative widening strategy: A1 should form a subset of the output of A2. But what are A1 and A2 and how do Dutch children establish A1 and A2 in early and late child Dutch, respectively?

According to the conservative widening learning strategy, the acquisition of *hoeven* takes place on the basis of positive evidence only.

Moreover, we assume distributional information to play a crucial role in the initial stage of analysing the NPI, as we do not assume any inherent awareness of *hoeven* being an NPI. Therefore, investigating the distributional pattern of *hoeven* in language input is a logical starting point to answer the questions elaborated above. As already mentioned in the previous section, clearly the most frequent licenser for the target NPI in child-directed Dutch turns out to be the negative marker *niet*, which is used 80.81% of the time (see also Appendix B). Among these utterances, we found that the percentage of co-occurrence of *hoeven* and *niet* with a distance between zero (i.e. adjacent co-occurrence) and three syllables reached 97.32%.¹⁷ Hence, *niet* is not only the most frequent licenser in child-directed speech, but it is also (nearly) adjacent to *hoeven*. Since children are already sensitive to this type of distributional information at a very early age (probably even before the age of two, cf. Santelmann and Jusczyk 1998), we propose that Dutch children's initial analysis A1 is that *hoeven* is lexically associated with *niet* as [HOEVEN NIET].¹⁸

A1 as [HOEVEN NIET] is very strict and conservative since it can only generate *hoeven*'s occurrence under the scope of *niet*; but it provides Dutch children an explanation for more than 80% of the language input. Nonetheless, there is still 20% of the input data that cannot be captured by A1 as [HOEVEN NIET]. These data may consist of *hoeven*'s occurrence under the scope of other forms of negation, for instance, under the scope of negative indefinites *geen*, *niks*, quasi-universal quantifiers *niet iedereen* 'not everybody' or exclusive adverbs *alleen*, *slechts* 'merely'. Such input data – which falsify A1 – trigger Dutch children to make a reanalysis of the target NPI. We observe that of the remaining 20% of language input containing *hoeven*, more than 15% are utterances in which this NPI is licensed by negative indefinites (Appendix B). Thus, Dutch children are expected to establish a reanalysis that allows *hoeven* to appear not only under the scope of *niet*, but also in negative sentences introduced by negative indefinites.

¹⁷ An investigation of *hoeven* licensed by the negative marker *niet* in child-directed Dutch (Bol and Kuiken 1990; Elbers and Wijnen 1992; Van Kampen 1994; Wijnen 1988, 1992; Wijnen and Bol 1993) leads to the following distribution pattern depending on the distance in terms of syllables between *hoeven* and *niet*: the percentage of adjacent co-occurrence is 42.58 %; the percentage of co-occurrence with a distance of one syllable is 36.91%; the percentage of co-occurrence with a distance of two syllables is 10.73%; the percentage of the co-occurrence with a distance of three syllables is 5.68%; and the percentage of the co-occurrence with a distance greater than three syllables is 4.1% (see also Appendix E).

¹⁸ Note that we do not want to claim that the children we studied are in the same stage as those studied by Santelmann and Jusczyk (1998). The crucial point here is that the first analysis these children made is very likely to be a lexical analysis, given the distribution of *niet* and *hoeven* in child-directed speech.

28 Acquiring Negative Polarity Items

Interestingly, however, negative indefinites can be analysed to contain an abstract negation incorporated in their underlying syntactic structure. Following Jacobs' (1980) analysis of negative indefinites, originally proposed for German, negative quantifiers represent a syntactically complex structure that consists of an abstract negation (NEG) and an existential quantifier (\exists). This syntactically decompositional view on negative quantifiers is argued to hold for Dutch as well (see Rullmann 1995; Zeijlstra 2011; among others). In line with Zeijlstra (2011), negative indefinites in Dutch can be analysed in the following syntactic way.

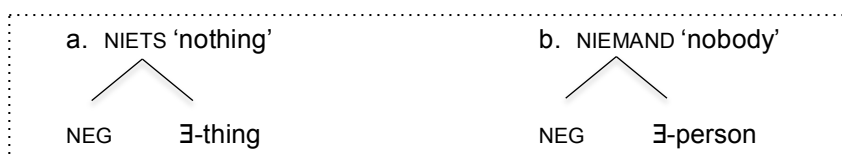


Figure 2: Decompositional analysis of negative quantifiers in Dutch

The syntactic structure of Dutch negative indefinites as proposed above is motivated by the existence of so-called split-scope readings of negative indefinites (Iatridou and Zeijlstra 2013; Penka 2012; Penka and Zeijlstra 2005; Rullmann 1995; Zeijlstra 2011). See an example in (16) below.

- (16) Je mag niks eten.
 you may nothing eat
 a. 'You are allowed to eat nothing.'
may > NEG > \exists -thing
 b. 'There is no specific thing that you are allowed to eat.'
NEG > \exists -thing > may
 c. 'It is not the case that you are allowed to eat a thing.'
NEG > may > \exists -thing

The example above has three readings, i.e. a narrow scope reading in which the negation together with the existential quantifier are interpreted under the scope of the modal verb *may* (16a); a wide scope reading in which the negation and the existential quantifier together scope over the modal verb *may* (16b); and a split-scope reading in which the negation and the existential quantifier are separately interpreted, such that the negation scopes over *may* and this modal verb in turn takes scope over the existential quantifier (16c). To illustrate the difference between these three possible interpretations of a Dutch sentence like (16), let us first consider a context in which a child would like to have some cookies or candies right before going to bed and asks his/her mum whether he/she may eat something. Suppose the mother utters (16) in response. A narrow scope interpretation of (16) would then mean that the mother gives her child the permission or authorization to eat nothing. A wide scope interpretation of the negative indefinite *niks*, on the other hand, generates a scenario in which the mother

does not have in mind any specific thing that the child is allowed to eat right before going to bed. Finally, by assigning a split-scope interpretation of the mother's utterance (16), the child reaches a situation in which he/she is just not allowed to eat anything before sleeping. In the pragmatic context we are describing here, the split-scope interpretation (16c) is by far the most salient and the only one possible. The availability of this split-scope reading by both the mother and the child in turn provides empirical evidence for the syntactic structure of Dutch negative indefinites as shown in Figure 2 in both adult and child language (cf. Zeijlstra 2011).

Given this decompositional analysis of negative quantifiers, we propose that in late child Dutch, *hoeven* must be lexically associated with an abstract negation that is present in all negative indefinites. This abstract negation is referred to as NEG; consequently, A2 can therefore be represented as [HOEVEN NEG].¹⁹ Compared to the constructional A1 as [HOEVEN NIET] in early child Dutch, A2 as [HOEVEN NEG] is a more abstract and general analysis since it not only generates *hoeven* under the scope of the negative marker *niet*, but also in all the other contexts containing an abstract negation. This abstract NEG can be phonologically realised by the specific negative marker *niet*, resulting in licensing of *hoeven* by the negative marker, or spelled-out as the negation incorporated in negative indefinites, leading to *hoeven*'s occurrence under the scope of negative indefinites. This is exactly how A2, i.e. the reanalysis of the initial A1, provides an explanation for the wider distribution of the target NPI in all negative contexts in late child Dutch. The developmental process from the lexical constructional analysis as [HOEVEN NIET] to the abstract analysis as [HOEVEN NEG] in child Dutch completely obeys the conservative widening learning strategy. Note that both the analysing and the reanalysing processes are triggered by positive evidence only. At the same time, since A2 is established in such a way that the set of its output takes the set of the output generated by A1 as its subset, as logico-semantically the set of negative environments introduced by *niet* form the subset of the set of negative contexts introduced by a negative indefinites,²⁰ the whole acquisitional

¹⁹ Here we assume that the process of generalising NEG from the sentential negative marker *niet* and negative indefinites such as *niks* or *niemand* is made possible by the following ingredients: a general learning strategy of abstracting structures or properties from concrete and lexical input and children's knowledge of the presence of an abstract negation NEG incorporated in Dutch negative indefinites (see our example of the child eating before bedtime). Due to space limitations, we do not discuss this generalising step in detail but leave this for further exploration (Lin et al. Under revision).

²⁰ The negative marker *niet* is an *Anti-Morphic* function. A function f is Anti-Morphic iff for every arbitrary X and Y , it holds: $f(X \cap Y) \leftrightarrow f(X) \cup f(Y)$ and $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ (adapted from Van der Wouden 1997). Negative indefinites such as *niks* 'nothing' or *geen* 'no(ne)' are *Anti-Additive*. A

30 Acquiring Negative Polarity Items

process of the target NPI can be described best in terms of the Subset Principle. More importantly, the developmental pathway motivated here signifies why frequency pattern in the input alone is not sufficient in explaining the acquisition of the NPI: without the linguistic knowledge of the decomposability of negative quantifiers at the syntactic level, Dutch children would not be able to extract the abstract negation NEG to develop an abstract representation of the target NPI from the lexical construction. The question is: how do we know that such linguistic knowledge is already available to children younger than the age of four?

In order to examine to what extent the decompositional analysis of negative indefinites is acquired in the first stage, we investigated spontaneous speech data of younger Dutch children. We found that as early as three years old, children are already able to produce utterances in the contexts where a split-scope interpretation of a negative quantifier is present. Altogether, 52 such utterances were attested in early child Dutch; two examples are illustrated below. This means that before the age of four, Dutch children have already acquired the syntactic structure of negative indefinites as elaborated in Figure 2. The reanalysing process of *hoeven* at approximately the age of four is therefore not a speculation but supported by independent evidence.

- (17) Je mag geen deurtje lenen. (2;11.09)
 you may no door borrow
 'You are not allowed to borrow a door.' NEG>may >∃-door
 (Wijnen and Bol 1993: jos21109.cha: line 356)
- (18) Ik kan niks horen. (3;06.21)
 I can nothing hear
 'I am not able to hear a thing.' NEG>can>∃-thing
 (Wijnen 1988: 30621.cha: line 1133)

The reanalysis of [HOEVEN NEG] can definitely explain an extremely large amount of children's input. However, at first sight, this abstract A2 does not appear to account for all input data Dutch children receive. This is because in a small amount of the input, i.e. 3.78% (Appendix B), the target NPI is licensed in negative contexts that are introduced by other operators than the negative marker *niet* and negative indefinites. Although we do not yet

function f is Anti-Additive iff for every arbitrary X and Y , it holds: $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ (adapted from Van der Wouden 1997).

If a function f is Anti-Morphic, then it is also always Anti-Additive, but not the other way around, since if a function f satisfies $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ and $f(X \cap Y) \leftrightarrow f(X) \cup f(Y)$, which means that it is Anti-Morphic, then it always satisfies $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$, i.e. being Anti-Additive. Thus, the set of Anti-Morphic contexts and that of Anti-Additive contexts stand in a subset relationship with each other.

observe any significant use of *hoeven* in such contexts in late child Dutch, as can be seen from Table 3, our account actually predicts that Dutch children do not need to further analyse the target NPI even when they are confronted with *hoeven*'s occurrence in weaker kinds of negative contexts than those introduced by *niet* or a negative indefinite. This is because all licensing contexts for *hoeven* observed in adult Dutch already follow from children's abstract reanalysis of this NPI in the later stage. As already mentioned, A2 [HOEVEN NEG] allows *hoeven* to occur in all linguistic contexts that contain a decomposable abstract negation NEG. In the residual of the input data, we found that all those weaker types of negative environments also contain a lexically decomposable NEG, because all contexts introduced by semi-negative expressions, such as *weinig* 'few' *niet iedereen* 'not everybody', or exclusive adverbs, like *alleen*, *slechts* 'merely', contain underlying abstract negation as well (Iatridou and Zeijlstra 2013; Penka 2011; Von Stechow and Iatridou 2003).

Given this line of reasoning, the fact that *hoeven* is still not attested under the scope of these weaker forms of negative expressions after children's establishment of the abstract A2 as [HOEVEN NEG] can only be explained as follows.²¹ Until the age of five, Dutch children do not show sufficient evidence of having acquired the lexical knowledge pertaining to the negative expressions in question. For example, merely two utterances of *niet iedereen* are observed in the child Dutch data collected from CHILDES and the total amount of the utterances containing *weinig* attested in child language is only nine (see Appendix D). Thus, the absence of *hoeven* in those weaker negative contexts can be explained by children's lack of the relevant lexical knowledge. On the other hand, although Dutch children of both age groups are able to productively use *alleen* and *pas* 'not until' – a temporal version of the exclusive *alleen* – in their spontaneous speech (see Appendix D), the non-significant occurrence of *hoeven* under the scope of these two operators may still result from the complexity of the operators as such. Pragmatic knowledge of scalar implicatures and presuppositions is essential for a child to analyse *alleen* as exhibiting a decomposable and abstract negation. With respect to *pas*, a temporal quantifier, children are required to acquire temporal concepts and their grammatical realizations before they may be able to extract the abstract negation incorporated in *pas*. The non-occurrence of the NPI *hoeven* in such weaker types of negative environments in late child Dutch is therefore not a consequence of how children analyse the NPI, but how they acquire and analyse weaker negative expressions such as *weinig*, *slechts*, *niet iedereen*. This leads to the

²¹ Of course, what children produce in their spontaneous speech does not always equal what they *can* produce. Because of the limitation of the methodology of the current research, i.e. a corpus investigation, we are not able to exclude another possibility: children are already able to license *hoeven* by different weaker forms of negation after their reanalysing process, but they just do not (yet) spontaneously produce such utterances. We leave this exploration for further research (Lin et al. Under revision).

32 Acquiring Negative Polarity Items

conclusion that A2 containing an abstract negation as presented as [HOEVEN NEG] is the final analysis of *hoeven* at the end of language acquisition, i.e. the adult analysis.

The adult analysis as [HOEVEN NEG] makes a prediction for how the NPI is distributed in adult Dutch, namely that *hoeven* is restricted to only those negative contexts containing a (decomposable) negation. An investigation of a total of 1694 utterances containing the target NPI collected in the CGN confirms this prediction (see a similar result observed in written Dutch in a previous corpus investigation by Hoeksema 1997: 11: Figure 5).²² As is shown below, *hoeven* is allowed to appear either in a negative context introduced by *niet* in (19) or under the scope of a negative indefinite as in (20). It may also appear in weaker kinds of negative contexts as in (21) and (22), since the abstract negation NEG present in these contexts can license the NPI, satisfying the reanalysis [HOEVEN NEG]. However, the adult analysis as [HOEVEN NEG] bans *hoeven* from those contexts in which an abstract negation is absent as in (23) to (26).

- (19) Jan hoeft vandaag niet te werken.
John needs today NEG to work
'John does not have to work today.'
- (20) Niemand hoeft vandaag te werken.
NEG-body needs today to work
'Nobody has to work today.'
- (21) Niet iedereen hoeft vandaag te werken.
NEG everybody needs today to work
'Not everybody needs to work today.'
- (22) Alleen Jan hoeft vandaag te werken.²³
NEG other than John needs today to work
'Only John has to work today.'
- (23) * Iedereen die hoeft te werken moet nu weg.
everybody COMP needs to work must now away
Intended: 'Everybody that has to work must leave now.'
- (24) * Als Jan hoeft te rijden moet hij mij ophalen.
if John needsto ride should he me pick up
Intended: 'If John has to ride he should pick me up.'

²² See footnote 9.

²³ We adopt a decompositional analysis of exclusive adverbs as proposed in Von Stechow and Iatridou (2003), among others. According to this analysis, exclusive adverbs such as English *only* and Dutch *alleen* contain a negation (NEG) and an exceptive component *other than*.

(25) * Wat hoeft Jan vandaag te doen?
 what needs John today to do
 Intended: 'What does John have to do today?'

(26) * Jan hoefde gisteren te werken.
 John needed yesterday to work
 Intended: 'John had to work yesterday.'

Given the examples above, it is obvious that the adult analysis as [HOEVEN NEG] makes *hoeven* exhibit a wider distribution than Dutch *ook maar* 'at all', restricted to Anti-Additive contexts only (Giannakidou 1997; Van der Wouden 1997),²⁴ but a narrower distribution than English *any*, allowed in all Downward Entailing contexts (cf. Ladusaw 1979).²⁵ As mentioned in Section 1, NPIs come about in different strengths, depending on the set of negative contexts that may license them. We therefore conclude that *hoeven* is a so-called strong/weak NPI that is in between *ook maar* and *any*, a typical strong and a typical weak NPI, respectively.²⁶

Moreover, the adult analysis as [HOEVEN NEG] suggests that *hoeven* is an NPI due to its lexical connection with an abstract negation NEG in a syntactic way: NEG is rooted in *hoeven*'s lexical representation but can be realised elsewhere in the sentence, for instance, as a negative marker *niet* or as the negation incorporated in a negative quantifier. This analysis of *hoeven* mirrors Postal's (2000) treatment of NPIs – an approach to properties underlying NPI-hood. However, this does not automatically mean that all NPIs should and can be identified by Postal (2000). In fact, we only expect NPIs of the same strength as *hoeven*, i.e. strong/weak NPIs, to bear a lexical connection with an abstract negation in their syntactic representation as [NPI NEG]. Likewise, since previous analyses to disentangle the property underlying the NPI-hood are proposed for the minimizing indefinite NPIs, denoting low-scale endpoints (such as English *any*, see

²⁴ A function f is Anti-Additive iff for every arbitrary X and Y , it holds: $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ (adapted from Van der Wouden 1997).

²⁵ A function f is *Downward Entailing* iff for every arbitrary X and Y it holds: $f(X \cup Y) \rightarrow f(X)$ and/or $f(X \cup Y) \rightarrow f(Y)$ (adapted from Van der Wouden 1997).

²⁶ Depending on in exactly which type of negative contexts an NPI can be licensed, four NPI-strengths are distinguished in the literature: superstrong NPIs that are allowed to appear under the scope of sentential negation only, such as Dutch *mals* 'mild'; strong NPIs that survive in all Anti-Additive contexts, like Dutch *ook maar* 'at all'; weak NPIs that are fine in all Downward Entailing contexts as is observed for English *any*-terms; and superweak NPIs such as Mandarin *shenme* 'a (thing)' are licensed in all nonveridical contexts, which cannot entail the truth of an embedded proposition (definition adapted from Zwarts 1998). For related discussion the reader is referred to Giannakidou (1998, 2002), Hoeksema (2000), Lin (2011a, 2011b), Nam (1994), Van der Wouden (1997), Zwarts (1986, 1998).

34 Acquiring Negative Polarity Items

Chierchia 2004, 2006; Kadmon and Landman 1993; Krifka 1994), we cannot expect *hoeven* – a universal NPI expressing necessity (cf. Kratzer 1981, 1991) – to be explained in a similar way; *hoeven*, given its universal force, requires a separate analysis for its NPI status.

This means that our investigation of the acquisition of the Dutch NPI also sheds light on a theoretical question of whether NPIs form a natural category in human languages that share a similar base underlying their polarity sensitivity. Because the acquisitional pathway from a lexical construction of [HOEVEN NIET] to a non-construction-specific configuration of [HOEVEN NEG] clearly shows children's development of a lexical dependency between *hoeven* and an abstract negation NEG, we conclude that *hoeven* has become an NPI due to its lexical association with the abstract negation NEG. The reason underlying its NPI-hood is therefore a direct result of children's acquisitional trajectory.

7 Alternative approaches

This section discusses two alternative approaches to the attested pathway of *hoeven*. The first approach is that of Van der Wal (1996) that takes children's initial step in acquiring the NPI as a consequence of their awareness of *hoeven*'s NPI status from the acquisitional onset and argues the developmental pathway of *hoeven* stems from the acquisition of different negative expressions in Dutch (Van der Wal 1996). The second approach is developed from the distributional learning mechanism of Mintz (2002) and Mintz et al. (2002) (see also Cartwright and Brent 1997; Redington et al. 1998), and we refer to this as *a lexical approach*. This approach would expect children to add up different lexical constructions of *hoeven* in later stages as well, instead of establishing an abstract reanalysis as [HOEVEN NEG]. However, this section shows that both alternative explanations are problematic in explaining the attested acquisitional pathway.

7.1 Van der Wal (1996)

Van der Wal (1996) is the first to address the learnability problem raised by the existence of NPIs. Postulating the hypothesis of conservative widening, she aimed to unravel the problem by investigating Dutch children's acquisition of two polarity items *hoeven* and *meer* 'anymore' via both corpus research and experiments; however, no exclusive evidence was claimed to be found for children's employment of this learning strategy in the acquisition of the NPIs. Instead, she argued for an acquisitional pathway of the two NPIs that stems from how and when Dutch children acquire negative expressions. Because "from the onset [Dutch children] are aware of the fact that NPIs cannot appear in all configurations" (Van der Wal 1996: 179), they only allow *hoeven* (and also *meer* 'anymore') to appear under the scope of a negation. Since *niet* is the only negation acquired in early child Dutch, the target NPIs are always licensed by this single licenser in an initial stage. In a

later developmental stage, when children have acquired different negative expressions in Dutch, for instance, negative indefinites *geen* and *niemand*, they start to license the NPIs by these late-acquired negations as well. This implies that *hoeven*'s restricted distribution to under the scope of the negative marker *niet* only in early child Dutch is a consequence of children's limited knowledge of what counts as a negation in adult grammar. This alternative explanation takes the acquisition of the NPI *hoeven* to be in tandem with that of Dutch negation and the observed widening pattern therefore represents children's (in)complete knowledge of various negative expressions at different stages (see also Koster and Van der Wal 1996). Although she speculated that "from the onset in children's speech [NPIs] have a *principled* restricted distribution, rooted in knowledge of the essence in NPI licensing" (Van der Wal 1996: 179), she did not discuss how and why Dutch children would have access to such knowledge. Thus, her speculation of children's awareness of *hoeven* being an NPI – already available from the very onset of language acquisition – leads to conjecturing some innate universal principle in NPI use for not only Dutch-acquiring children but also their English and German counterparts (Van der Wal 1996: Ch. 5: 5.3). Our explanation in Section 6 clearly shows that the distributional properties of *hoeven* in child-directed Dutch alone are already sufficient for children to make the first step in its acquisition; it is therefore unnecessary to adopt innate knowledge here. Moreover, in what follows, we present three pieces of evidence against *hoeven*'s developmental pathway determined by children's acquisition of negation as proposed by Van der Wal.

First, we found in our corpus data that Dutch children younger than the age of four are already able to spontaneously and productively use at least three of the five negative indefinites attested as licensers for *hoeven* in adult Dutch, i.e. *geen*, *niks* (*niets*) and *niemand*. The frequency data presented in the table below reject Van der Wal's proposal.²⁷ Therefore, that *hoeven*'s distribution is restricted to under the scope of *niet* only in early child Dutch does not lie in younger children's lack of lexical knowledge of diverse negative indefinites. This means that the developmental pattern observed in the acquisition of *hoeven* (see Figure 1) cannot be taken as a reflection of Dutch children's (in)complete acquisition of various negative operators of different ages.

²⁷ Data were collected from the same subcorpora in the CHILDES database (MacWhinney 2009) as introduced in Section 4.

36 Acquiring Negative Polarity Items

Negative indefinites	Age: <4
<i>geen</i> 'no(ne)'	285
<i>niks (niks)</i> 'nothing'	202
<i>niemand</i> 'nobody'	23
<i>nooit</i> 'never'	9
<i>nergens</i> 'nowhere'	0
Total	519

Table 4^{28,29}: Frequency of different negative indefinites in early child Dutch

Secondly, we observed that in early child Dutch, negative indefinites already occur in combination with a variety of modal verbs, such as *willen* 'will', *kunnen* 'can' and *mogen* 'may', which are polarity insensitive modal verbs, and *moeten* 'must', which counts as a PPI in the adult grammar (Homer 2011; Iatridou and Zeijlstra 2010, 2013). Altogether, 51 instances were attested in this respect. The co-occurrence of negative indefinites and almost every other modal verb with the exception of *hoeven* in early child Dutch necessarily excludes the explanation of Van der Wal (1996). If the distribution of *hoeven* in early child Dutch were determined by children's incomplete acquisition of negation, we would not be able to account for why, in the first stage, only *hoeven* is not allowed to appear in negative environments introduced by a negative indefinite.

Finally, we found overgeneralisation errors of the negative marker *niet* to the negative quantifier *geen* when it comes to the licensing of *hoeven*. Such overgeneralisation errors concern ungrammatical utterances of Dutch children younger than the age of four. See the a-sentences below, in which an asterisk denotes their ungrammaticality in adult grammar; the grammatical counterparts in adult Dutch are given in the b-sentences.

- (27) a. *Ik hoe(f) melkje niet.
 I need milk not
 Intended: 'I do not want any milk.'
 (Van Kampen 1994: laura12.cha: line 34)
- b. Ik hoef geen melk.
 I need no milk
 'I do not want any milk.'

²⁸ Only the frequency of the five negative indefinites that are attested in adult Dutch was included here (see further footnote 9; the relevant data are presented in Appendix C). Note that two instances of concord-like use of negative indefinites are excluded, such as *ik hoef nooit geen huisdier te hebben* (lit. 'I need never no pet to have', meaning 'I would never like to have a pet').

²⁹ Among all the occurrences of the negative operators in Table 4, only one instance of *hoeven* licensing is attested, in which the negative quantifier *geen* is employed.

- (28) a.* (Ik) hoef niet suiker.
 I need not sugar
 Intended: 'I do not want any sugar.'
 (Wijnen and Bol 1993: jos300020.cha: line 102)
- b. Ik hoef geen suiker.
 I need no sugar
 'I do not want any sugar.'

Both a-sentences are not ungrammatical due to illegal licensing of *hoeven*. These utterances are ungrammatical because adult Dutch speakers would employ *geen* instead of *niet* to quantify a noun phrase, i.e. *melk* 'milk' in (27) and *suiker* 'sugar' in (28). A closer look at Dutch children's spontaneous speech production leads to the observation that children only use *niet* instead of *geen* in contexts in which *hoeven* needs to be licensed. Among a total of 168 utterances in which *hoeven* occurs under the scope of *niet* (see Table 3), we found 22 instances of this kind of overgeneralisation error. Since such overgeneralisations are only restricted to the NPI, the explanation for (27a) and (28a) can hardly lie in children's incomplete acquisition of negation in the first stage. Given our central claim that the developmental pattern of the acquisition of *hoeven* represents different analyses of this NPI by Dutch children of different ages, we come to the conclusion that (27a) and (28a) can only be explained in one way: in our view, the target NPI has not yet been reanalysed as [HOEVEN NEG] in early child language. With their strict A1 as [HOEVEN NIET], children younger than the age of four are only able to allow *niet* to license the target NPI, resulting in overgeneralisation of *niet* for *geen* as shown in (27a) and (28a).

Moreover, we attested a significant decrease of the total amount of such overgeneralisations in late child Dutch, i.e. when *hoeven* is analysed as [HOEVEN NEG] ($p=.042$, $df=1$). Since even before the age of four, Dutch children are already able to productively use *geen* outside the contexts of the licensing of *hoeven*, as illustrated in Table 4, the significant decrease exclusively supports our proposal that different analyses of the target NPI shape its acquisitional pathway. Therefore, the acquisition of the NPI *hoeven* does not stem from how Dutch children acquire different negative expressions in adult language.

7.2 A lexical approach

As shown in Mintz (2002), Mintz et al. (2002) and Redington et al. (1998), a distribution-based learning strategy can perfectly well predict early processes of learning grammatical categories, such as noun and verbs. Since we do not assume innate linguistic knowledge of *hoeven* being an NPI, we adopted the distributional perspective in language acquisition to explain how Dutch children initially analyse the target NPI as having a lexical dependency with the negative marker *niet* and establish a constructional analysis as [HOEVEN NIET]. When confronted with input data falsifying the lexical frame, children abandon the lexical analysis developed via the distribution-based learning modal and switch over to a more abstract but

38 Acquiring Negative Polarity Items

less rigid reanalysis as [HOEVEN NEG]. This step in abstracting the analysis of the target NPI is supported by the observation that children have already acquired the decomposable syntactic structure of Dutch negative indefinites before the age of four. Because the reanalysis is of great generalisability in the sense that it explains all input data, including the co-occurrence of *hoeven* and *niet*, children do not need to further analyse the NPI and [HOEVEN NEG] turns out to be the adult analysis of the NPI. The whole acquisitional process from a purely lexical analysis as [HOEVEN NIET] to a more abstract and generalisable reanalysis as [HOEVEN NEG] is captured by the Subset Principle, since the set of output of the lexical constructional analysis in the early stage forms a subset of the set of the output generated by the abstract reanalysis in the late stage.

However, one might argue that children could also continue to employ a distributional mechanism in a later stage when they receive or can analyse more input data conflicting with the lexical frame as [HOEVEN NIET]. Among these input data, we found that more than 70% exhibit a co-occurrence of *hoeven* and *geen* within a distance of three syllables (see Appendix E). From a distributional perspective, such input evidence could still trigger Dutch children to establish a lexical dependency between *hoeven* and *geen* and construct a second lexical frame as [HOEVEN GEEN]. Along this line of reasoning, the distributional information of *hoeven* in child-directed speech (see Appendix E) would lead Dutch children to continually establish a third lexical frame as [HOEVEN NIKS], a fourth construction as [HOEVEN MAAR], a fifth construction as [HOEVEN ALLEEN], and a sixth frame as [HOEVEN NOOIT]. As such, the acquisition of *hoeven* by older children can be described as a process of adding up lexical constructions according to the distributional properties of the NPI in the language input. This acquisitional process from a distributional perspective could also be captured by the Subset Principle due to the subset relationship between the singleton set containing a single lexical frame as [HOEVEN NIET] and the set containing multiple lexical constructions, such as [HOEVEN NIET], [HOEVEN NIKS], and [HOEVEN MAAR]. But is this lexical explanation plausible? In other words, to what extent is the abstraction in the reanalysis as shown in Section 6 required? Our discussion of the lexical approach begins with revisiting input evidence in child-directed Dutch and the target distribution of *hoeven* in adult Dutch.

In child-directed Dutch, we found a total of 40 child-directed utterances containing *hoeven* co-occurring with *geen* within a distance of three syllables (see Appendix F). Given that our child-directed data were collected from a total of 331.5 hours of recording (see Appendix G), equal to approximately 33 days (based on the assumption that a child younger than the age of five is awake for 10 hours per day), this amounts to one utterance of *hoeven* under the scope of *geen* per day. Hearing *hoeven* co-occurring with *geen* within a distance of three syllables once a day does not appear to us as sufficiently frequent for children to establish a second lexical frame as [HOEVEN GEEN]. Nevertheless, we can still imagine that children might be able to form this second construction after repeatedly being confronted with

the co-occurrence of *hoeven* and *geen* once per day for, let's say, two weeks.

However, if we focus on the frequency of the co-occurrence of *hoeven* with *niks* (*niets*) or *alleen* within a distance of three syllables among all input utterances containing the target NPI, it becomes particularly doubtful that Dutch children would still be able to employ the distributional learning model. The frequency of *hoeven* co-occurring with *niks* (*niets*), *maar*, and *alleen* in child-directed Dutch is 13, 7, and 4, respectively (see Appendix F). Based on a total of approximately 33 days of data recording, these input frequencies entail merely one utterance of *hoeven* with *niks* (*niets*) every three days, one utterance of *hoeven* with *maar* every five days, and one utterance of *hoeven* with *alleen* about every nine days. This gives an idea of how limited one utterance of *hoeven* co-occurring with these licensors is and makes it improbable that children only rely on distributional information to acquire all the licensors separately.

Moreover, the lexical approach wrongly predicts Dutch children's acquisition of the NPI to be incomplete at the age of five. Due to non-robust and insignificant co-occurrence of the NPI with various non-*niet* licensors in child-directed speech, the distributional perspective would predict the acquisition of *hoeven* to be strongly successive and individually distinct because of subtle differences in distributional patterns of the NPI by individual speakers. This would, to a large extent, imply the existence of variations among adult Dutch speakers with respect to *hoeven* licensing; the distribution of the NPI restricted to a unified set of Downward Entailing contexts observed in adult Dutch via the CGN (Oostdijk 2004, see Section 6) would then merely be coincidental. On the contrary, our approach to the licensing of *hoeven*, in which older Dutch children establish the abstract reanalysis as [HOEVEN NEG], does not easily allow individual variation; the fact that in adult Dutch, *hoeven* may only appear in a unified set of negative contexts containing a decomposable negation is then not attributed to coincidence either. Due to the presence of the abstract semantic negation (NEG) in their underlying analysis of the NPI, Dutch native speakers restrict *hoeven* to only those contexts in which NEG incorporated in *hoeven*'s syntactic representation can be spelled-out. However, before language learners can allow all possible licensors to license the NPI, they are required to first obtain the knowledge that these licensors contain an underlying, decomposable negation NEG (see also the related discussion in Section 6). Our approach therefore expects developmental variation, depending on how and why a learner acquires the decomposable analysis of the licensors involved. Nevertheless, equipped with a single analysis as [HOEVEN NEG], Dutch children may potentially show adult-like distribution of the NPI. In comparison to having to collect a minimum of five lexical frames based on non-robust distributional information before achieving adult-like behaviour of *hoeven*, with an added risk of large individual variations, establishing an abstract and generalisable analysis of this NPI is more economical and efficient for a child acquiring Dutch.

40 Acquiring Negative Polarity Items

The lexical approach to the acquisition of the NPI is problematic from a theoretical perspective as well. Due to its ignorance of the existence of abstraction in language (acquisition), the lexical approach does not have any implications for why NPIs exhibit sensitivity to the negativity of an utterance, i.e. properties underlying NPI-hood, and why this sensitivity come about in different degrees, i.e. explanations for NPI-strength. The list of lexical frames of *hoeven* that older Dutch children might have established via the distributional learning approach does not explain why *hoeven* is an NPI; and *hoeven*'s strength as an NPI appears to us as randomly determined in this view. More importantly, the lexical approach disregards the existence of well-established semantic categories in natural languages. By considering only the distributional pattern of *hoeven* in the language input, the lexical approach to the attested acquisitional pathway overlooks the similar logico-semantic behaviour of, for instance, *niks* and *nooit*, two Anti-Additive functions in Dutch based on a standard categorisation in this respect (Giannakidou 1998; Van der Wouden 1997; Zwarts 1986, 1998). Because of a large difference between the co-occurrence frequency of *hoeven* with *niks* on the one hand, and *hoeven* with *nooit* on the other, the distribution-based explanation would predict Dutch children to construct the lexical frame [HOEVEN NIKS] much earlier in their acquisition than [HOEVEN NOOIT], leading to a disconnection between these two negative operators despite their common logico-semantic properties.

However, falsifying the distributional proposal of diverse lexical frames containing *hoeven* in late child Dutch calls for more experimental research that examines older children's performance on *hoeven* co-occurring with different licensers of extremely low or even zero frequency in child-directed speech, such as *alleen*, *niemand* and *weinig*. This alternative approach would then predict children's bad performance when they are confronted with *hoeven* co-occurring with these licensers. Conversely, our approach that older Dutch children have already established the abstract analysis [HOEVEN NEG] would predict children's good performance independent of the input frequency of different *hoeven*-licensers – on a single condition that Dutch children have already acquired these licensers as containing an underlying, decomposable negation NEG (see also the related discussion in Section 6). We leave this experimental exploration for further research (Lin et al. Under revision).

8 Conclusions

By focusing on Dutch children's acquisition of *hoeven*, the current paper explores a solution to a learnability problem of NPIs due to the absence of both direct and indirect negative evidence (Section 2). We started by showing that a statistical learning mechanism based on statistical pre-emption cannot explain how children would be able to acquire NPIs, because lexical elements exhibiting a complementary distribution with NPIs

such as *hoeven* barely exist, violating a crucial condition for a statistical mechanism to function (Section 2). We then elaborated, based on the corpus data collected in the CHILDES database, on why only the conservative widening learning hypothesis can solve the learnability problem (Section 3 and Section 4). We showed that Dutch children conservatively weaken down their analysis of the NPI in accordance with the positive evidence in their input, resulting a developmental pattern in compliance with the Subset Principle (Section 5). This prevents any type of impossible acquisitional pattern: since children cannot unlearn to overuse *hoeven* in non-licensing contexts, their acquisition of this NPI cannot start out with this kind of error, but must start out conservatively. Our investigation of *hoeven*'s distribution in child Dutch development yields an acquisitional pathway that represents two distinct analyses of the NPI by Dutch children of different ages: a constructional analysis as [HOEVEN NIET] and an abstract reanalysis as [HOEVEN NEG] in early and late child Dutch respectively (Section 6). Our approach to this pathway does not presume innate linguistic knowledge of *hoeven* being an NPI but employs distributional information in the language input as much as possible in understanding children's first attempt at analysing the NPI. Moreover, since the syntactically decompositional analysis of Dutch negative indefinites is necessary for the process of reanalysis, we concluded that *hoeven*'s development in child Dutch is explained when both input evidence and the acquisition of independent linguistic knowledge of negative indefinites are taken into consideration. Further corpus data collected in adult Dutch from the CGN confirmed that the reanalysis as [HOEVEN NEG] signifies exactly how adult speakers analyse the NPI, suggesting that no further analysing process is necessary for children acquiring Dutch once they establish the abstract reanalysis as [HOEVEN NEG], which occurs after the age of four.

This paper adopts a distributional learning approach in establishing the initial lexical analysis of the target NPI, and therefore shows that it is not necessary to presume innate linguistic knowledge of *hoeven* being an NPI, contrary to Van der Wal (1996). On top of that, we also presented three pieces of evidence from child Dutch against Van der Wal's approach, which takes the developmental pattern of *hoeven* to be determined by the acquisition of Dutch negation (Section 7.1). On the other hand, however, an explanation of the attested pathway that relied solely on distributional information throughout the whole course of language development also appeared to be problematic in the particular case of the NPI (Section 7.2). This explanation makes incorrect predictions for the distribution of *hoeven* in both child Dutch and adult Dutch. Because this approach is ignorant of the existence of abstraction in (the acquisition of) different grammatical aspects, it does not contribute to previous theories of NPI-hood and NPI-strength. However, in order to examine the distribution-based learning model in late child Dutch, experimental data must be investigated. Therefore, further research on children's performance on utterances containing *hoeven* under an experimental design is in order (Lin et al. Under revision).

42 Acquiring Negative Polarity Items

The current research on Dutch children's acquisition of *hoeven* leads to a prediction for the acquisition of NPIs in general. Since the conservative widening learning strategy is shown to be the only possibility to solve the learnability problem of NPIs, which is caused by the absence of both direct and indirect negative evidence, we expect all NPIs, irrespective of their strength or language, to be acquired via this learning model. Nevertheless, as illustrated in this paper, language input plays a crucial role in triggering an initial analysis and a reanalysis of an NPI; different NPIs can therefore exhibit distinct developmental pathways – both intra- and cross-linguistically – depending on their distributional properties in child-directed speech. The acquisition of NPIs thus takes place on an individual basis: acquiring some particular NPI does not signal to the learner that there is a single natural class of NPIs.

Chapter III

A learning path from lexical frames to abstract knowledge: evidence from Dutch children's acquisition of NPI modal *hoeven* 'need'

Abstract

Negative polarity items (NPIs) are lexical items that are restricted to (certain) negative contexts only (cf. Ladusaw 1979). *Yet* is an NPI: *John has *(not) finished yet*. The existence of NPIs raises a learnability problem for language learners: how can they detect the distributional constraints of NPIs, determined by the negativity of a sentence, if they never hear **John has finished yet* in the language input? By investigating children's performance in an elicited imitation task (2;09–5;10; N=132), this paper explores the acquisition of *hoeven* 'need', a modal NPI in Dutch that is shown to be licensed only in contexts where a decomposable abstract negation is present (after Lin et al. 2015). Data collected from the experiment demonstrate a learning path of *hoeven* in which children start with two lexical frames [HOEF NIET] 'NEED NOT' and [HOEF GEEN] 'NEED NO' but switch to an abstract grammar of it later on, i.e. [HOEF NEG] 'NEED NEG'.

1 Introduction

Negative polarity items (NPIs) are words or expressions that can only appear in contexts that are negative in one way or another. English *any*-terms are well-studied examples. As demonstrated below, such NPIs are generally only licensed in Downward Entailing contexts (cf. Ladusaw 1979), which according to Zwarts' categorisation form a kind of negative environment (Zwarts 1981, 1986, 1995).¹ In particular, *any*-terms are licensed in the scope of the sentential negation *not*, a negative indefinite *nobody*, or a semi-negative adverb *hardly*, as shown in (1a) to (1c); in the restriction of a universal *every*, as illustrated in (1d), and in a conditional

* This chapter is adapted from Lin, Jing, Fred Weerman, and Hedde Zeijlstra. (Under revision). A learning path from lexical frames to abstract knowledge: evidence from Dutch children's acquisition of NPI modal *hoeven* 'need'.

¹ Downward Entailing contexts are defined based on their logico-semantic behaviour. For every arbitrary X, Y : if $f(X \cup Y) \rightarrow f(X)$ and/or $f(X \cup Y) \rightarrow f(Y)$, then the function f is Downward Entailing. This definition is adapted from Van der Wouden (1994).

44 Acquiring Negative Polarity Items

clause, as given in (1e), *any* is also lowered. In simple affirmative contexts, however, the appearance of *any*-terms is ungrammatical, as shown in (2).

- (1) a. Sam did not eat any cookies yesterday.
b. Nobody ate any cookies yesterday.
c. Sam hardly ate any cookies.
d. Every child that ate any cookies yesterday went to the zoo.
e. If Sam ate any cookies yesterday, he went to the zoo as well.
- (2) *Sam/*Somebody ate any cookies yesterday.

The Dutch modal verb *hoeven* 'need' is also an NPI exhibiting a restricted distribution to negative contexts (Hoeksema 1994, 2000; Van der Wouden 1997; among others):

- (3) *Sam/*Iemand hoefde gisteren te voetballen.
Sam/somebody needed yesterday to play football
Intended: 'Sam/Somebody needed to play football yesterday.'

However, compared to English *any*-terms, Dutch *hoeven* exhibits a more restricted distribution, limited to merely a subset of Downward Entailing environments (Hoeksema 2000; Lin et al. 2015; Zwarts 1981, 1986, 1998). As demonstrated in (4a), (4b), and (4c), respectively, *hoeven* can be licensed by the sentential negation *niet* 'not', negative indefinites like *niemand* 'nobody', or semi-negative adverbs like *nauwelijks* 'hardly', which are all Downward Entailing operators; but in other Downward Entailing contexts, such as the restrictive clause of universal quantifiers or conditional clauses, *hoeven* is not allowed, as shown in (4d) and (4e).

- (4) a. Sam hoefde gisteren niet te voetballen.
Sam needed yesterday not to play football
'Sam did not need to play football yesterday.'
- b. Niemand hoefde gisteren te voetballen.
nobody needed yesterday to play football
'Nobody needed to play football yesterday.'
- c. Sam hoefde nauwelijks te voetballen.
Sam needed hardly to play football
'Sam hardly needed to play football.'
- d.* Ieder/*Elk kind dat hoefde te voetballen ging naar het
each/eachchild that needed to play football went to the
voetbalveld.
football field
Intended: 'Each/Every child that needed to play football went to the
football field.'

- e.* Als Sam hoefde te voetballen ging hij ook naar het
if Sam needed to play football went he also to the
voetbalveld.
football field
Intended: 'If Sam needed to play football, he went to the football
field too.'

The existence of NPIs such as Dutch *hoeven* yields a learnability problem for language-acquiring children (Lin et al. 2015; Tieu 2013; Van der Wal 1996). If the ungrammatical examples presented above do not appear in the language input, how is it possible for Dutch children to detect the target distributional pattern of this modal NPI restricted to negative contexts such as (4a) to (4c)? After all, the absence of ungrammatically used *hoeven* in the input does not necessarily indicate its ungrammaticality in non-licensing environments.

In order to investigate the acquisition of *hoeven*, we executed an elicited imitation task with 133 monolingual children (2;09–5;10), in which the participants were asked to repeat pre-recorded stimuli containing the modal NPI in different (non-)licensing environments exactly as they heard them. Based on the experimental results, we employed a general linear mixed-effect logistic regression analysis in R to model the developmental pattern of the NPI for each of the manipulated (non-)licensing conditions. This enables us to discuss possible acquisitional paths of the Dutch NPI.

Our experimental exploration will lead to the following conclusions. First, the acquisition of *hoeven* exhibits two stages: a lexical stage in which Dutch children analyse the NPI by two lexical frames, i.e. [HOEF NIET] 'NEED NOT' and [HOEF GEEN] 'NEED NO', and an abstract stage that contains just one abstract analysis, namely [HOEF NEG]. Second, children's acquisition of the decomposable analysis of Dutch negative indefinites (cf. Jacobs 1980) triggers their acquisition of [HOEF NEG]. Moreover, input frequency only plays a crucial role in the lexical stage and cannot explain children's acquisition of the abstract analysis of the NPI later on.

We start out with a brief introduction to the various licensing environments of NPIs and an overview of two previous studies addressing the learnability problem of the Dutch modal NPI *hoeven*: Van der Wal (1996) (see also Koster and Van der Wal 1996) and Lin et al. (2015). Next, we present our experimental method: the elicited imitation task. We then introduce our experiment, including the participants, procedure, and test conditions. Afterwards, we present our regression results, which are followed by a discussion and conclusion.

2 Background

2.1 NPIs and negative contexts

Ladusaw (1979) proposes that NPIs are generally licensed in Downward Entailing contexts: contexts in which the entailment relation goes from set to subset (see also Fauconnier 1975, 1978). Downward Entailing contexts can be further divided into three types, depending on their logico-semantic behaviours: Anti-Morphic contexts, Anti-Additive but not Anti-Morphic contexts, and Downward Entailing but not Anti-Additive contexts (Zwarts 1981, 1986, 1998).² These contexts – as proved by Zwarts – stand in a subset relationship with each other. For instance, all Anti-Morphic contexts are Anti-Additive and Downward Entailing, but not vice versa. Such a subset relation can be represented as in Figure 1.³

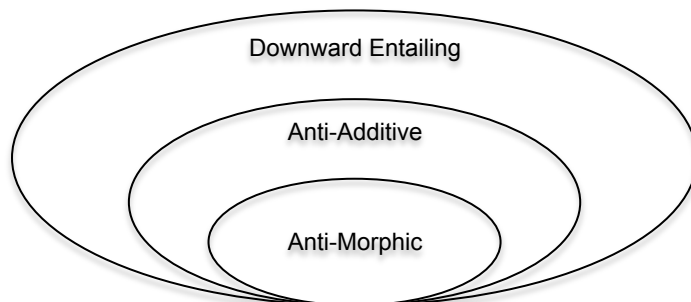


Figure 1: The subset relation between three types of Downward Entailing contexts

In the context of the Dutch modal NPI, it is relevant to know the following. First, the sentential negative marker *niet* ‘not’ is Anti-Morphic. Second, negative indefinites such as *geen* ‘no(ne)’ and *niks* ‘nothing’ are Anti-Additive but not Anti-Morphic. Finally, semi-negative expressions such as

² For every arbitrary X, Y : iff $f(X \cap Y) \leftrightarrow f(X) \cup f(Y)$ and $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$, then the function f is Anti-Morphic; iff $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$, then the function f is Anti-Additive. These definitions are adapted from Van der Wouden (1994).

³ This hierarchy is adapted from Zwarts (1981, 1986, 1998). In his original hierarchy of negative expressions, Anti-Morphic operators are categorised as *classical negation*, Anti-Additive contexts are termed as *regular negation*, and Downward Entailing conditions are defined as *minimal negation*. In his later work with Giannakidou (Giannakidou and Zwarts 1999), this hierarchy is further developed as containing a fourth layer outside the space of Downward Entailing, i.e. nonveridicality (see also Giannakidou 1997, 1998). Since the notion of nonveridicality is not at play in *hoeven* licensing (Lin et al. 2015), it is not discussed here.

weinig 'few' and exclusives such as *alleen* 'only' are merely Downward Entailing.⁴

2.2 Van der Wal (1996): a learning path of *hoeven* in tandem with the acquisition of negation

The learnability problem of NPIs was first explicitly addressed in Van der Wal (1996) (see also Koster and Van der Wal 1996).⁵ To examine the learning path of *hoeven*, Van der Wal carried out three acquisitional studies: a cross-sectional corpus-based study (1;05.09–3;10.17; N=15), an elicited imitation task with context provided plus acting out (3;00–3;11; N=15),⁶ and a grammaticality judgement task using paper and pencil (7;09–19; N=104).⁷ Van der Wal manipulated four test conditions in the elicited imitation task: licensing by the sentential negation *niet* 'not', the negative indefinite *geen* 'no(ne)', the exclusive adverb *alleen* 'only', and an ungrammatical condition that contained unlicensed *hoeven*. The grammaticality judgement task covered five additional licensing conditions: licensing both by negative indefinites *niks* 'nothing' and *nooit* 'never' as well as by semi-negative expressions *weinig* 'few', *niet alle* 'not all', and *bijna niks* 'almost nothing'.

The main finding of the three studies was that some negative operators were acquired as licensers for *hoeven* at a younger age than other negative expressions. In the corpus study, Van der Wal observed that Dutch children below approximately the age of three almost always uttered the NPI in the scope of the sentential negation *niet*, and only a few utterances containing *hoeven* licensed by the negative indefinite *geen* were attested. The results of the elicited imitation task confirmed this pattern for younger Dutch children, as the author found the highest imitation score of the three-year-olds for the licensing condition in which *hoeven* appeared in the scope of the sentential negation (at 85%). On top of this, the results obtained in the imitation task revealed that these younger children could also repeat the

⁴ We follow Von Fintel (1999) and analyse exclusive adverbs as a specific kind of Downward Entailing operator.

⁵ Van der Wal (1996) investigates the two most frequently used NPIs in child Dutch development, i.e. the modal verb *hoeven* 'need' and the temporal adverb *meer* 'anymore'. Because this paper focuses on *hoeven*, we only discuss Van der Wal's findings of this modal NPI.

⁶ For her elicited imitation task, Van der Wal had also piloted with children aged between approximately four and seven years old. However, as she observed a difference between the levels of meta-linguistic knowledge of children depending on their ages, she only reported the results of the three-year-olds, because the older children were not considered to be good candidates for her elicited repetition task with context provided plus acting out.

⁷ The participants included in the grammaticality judgement task represented five different age groups: seven- and eight-year-olds (7;09–8;10; N=22), nine- and ten-year-olds (9;05–10;10; N=20), eleven- and twelve-year-olds (11;07–12;09; N=20), thirteen- and fourteen-year-olds (13;08–14;07; N=20), and eighteen- and nineteen-year-olds (N=24).

48 Acquiring Negative Polarity Items

stimuli containing *hoeven* licensed by the negative indefinite *geen* and those containing the NPI in the scope of the exclusive adverb *alleen* – though at lower ratios (at 56% and 58%, respectively). Among all of the eight licensing conditions manipulated in the grammaticality judgement task, Van der Wal found that the seven- and eight-year-olds exhibited the highest acceptance ratios in the licensing conditions by the sentential negation *niet*, the negative indefinite *geen* or *niks*, and the semi-negative quantifier *weinig* (all above 90%); whereas the lowest acceptance ratio was attested when *hoeven* was licensed by the negative temporal adverb *nooit* (at around 70%).

Van der Wal interpreted these findings as evidence for an acquisitional pathway of the NPI that is determined by the development of children's knowledge of what counts as a negation in their target language. She explained the observed learning pattern based on both her corpus and experimental results as a consequence of the order in which children acquired different negations. For instance, she argued that the appearance of *hoeven* in the scope of the sentential negation *niet* only in early child language was due to children's limited knowledge of *niet* being the only valid negative form in their target language. Therefore, children would only start to produce *hoeven* in the scope of *niks*, for example, after acquiring that *niks* is also a negation in Dutch.

This hypothesis gave rise to a learning path of the NPI rooted in the development of children's knowledge of different negations. Van der Wal presented corpus evidence for a correspondence between the order of emergence of different negative expressions and the order in which these expressions appeared as *hoeven* licensors (Van der Wal 1996: 4.2.2). The conclusion was then that the acquisition of NPIs is *in tandem* with the acquisition of negation: "Expansion of the negation vocabulary gives children the opportunity to unfold the already present sensitivity to the restricted distribution of NPIs, and the one-sided use of *niet* (*not*) gradually gives way to more variety in licensing, thus approaching the adult model of licensing more closely" (Van der Wal: 1996: 4.2.2).

Van der Wal's learning path may capture how the development of NPIs in child language proceeds; however, it cannot explain why in the acquisitional onset children are already aware that NPIs cannot occur freely in all configurations but instead must be restricted to negative environments. In other words, what makes the modal NPI *hoeven* different from, for instance, *willen* 'will' or *kunnen* 'can' – both modal verbs in Dutch – such that *hoeven* is almost only attested in the scope of negation in child language, whereas *willen* and *kunnen* are not?⁸

⁸ Data collected in CHILDES (MacWhinney 2009) show that the modal verb *kunnen* 'can', for instance, appears only 36% of the time (698 out of 1940) in the scope of the sentential negation *niet* in spontaneous speech by children below age three; on the other hand, the NPI modal *hoeven* appears at 86% in the scope of *niet* in early child language (Lin et al. To be submitted). See also the related discussion in Van der Wal (1996: 2.7.3).

Van der Wal's answer to this question is that Dutch children are already equipped at onset with the knowledge that *hoeven* is an NPI, which restricts the modal to negative contexts only (Van der Wal 1996: 179). However, she did not discuss where this knowledge would come from and how Dutch children would have access to it, which gives rise to an assumption of some innate linguistic knowledge of *hoeven*'s NPI-hood. A greater challenge here is that the assumption of innate linguistic knowledge of *hoeven*'s NPI-hood cannot explain the target (or adult) distribution of this NPI as exemplified in the introduction: why *hoeven* is more restricted in its distribution than *any*-terms in English, which are also NPIs (compare (1) with (4); see also Lin et al. 2015 for a related discussion).

2.3 Lin et al. (2015): from [HOEF NIET] to [HOEF NEG]

More recently, Van der Wal's learning hypothesis of *hoeven* has been re-examined (Lin et al. 2015). By analysing corpus data collected from 59 monolingual Dutch children aged between approximately one and five years old, Lin et al. show that input evidence alone is sufficient to explain children's initial awareness of *hoeven* being an NPI, rendering it unnecessary to adopt any innate linguistic knowledge of *hoeven*'s NPI-hood.

Moreover, the authors present counterevidence against the acquisitional hypothesis of the NPI proposed by Van der Wal. For instance, they find that children younger than the age of four are already able to spontaneously and productively use negative indefinites *geen*, *niks*, and *niemand*, but they do not employ any of these as *hoeven* licensors in their spontaneous speech. Furthermore, the authors find in early child Dutch that negative indefinites already occur in combination with a variety of modal verbs, such as *willen* 'will', *kunnen* 'can', *mogen* 'may', and *moeten* 'must', but not yet in combination with the NPI modal *hoeven*.

The corpus data collected in Lin et al. lead to two distinct phases in the acquisition of the NPI, with the age of four as a watershed. At the first stage, children only produce *hoeven* in the scope of the sentential negation *niet*, whereas later on they also use negative indefinites such as *geen* or *niks* to license the NPI. By taking *hoeven*'s distribution in child-directed speech into consideration, Lin et al. explain the two-stage acquisition of the NPI as follows.

Children start with an assumption that *hoeven* has a lexical dependency with the sentential negation *niet* based on the input evidence that *hoeven* co-occurs with *niet* within a distance of three syllables around 80% of the time. Given the massive co-occurrence of *hoeven* and *niet* within three syllables in the input, the most economic and straightforward analysis by children is to establish a lexical frame as [HOEF NIET]. However, the lexical analysis of *hoeven* cannot explain the remaining 20% of the input evidence, in which *hoeven* does not co-occur with *niet* but instead appears in the scope of other operators than *niet*, such as *geen* or *alleen*. Thus, children are expected to make a reassessment of the NPI such that it explains as much input evidence as possible.

50 Acquiring Negative Polarity Items

In the remaining 20% of the input, Lin et al. report that 15% contain the NPI appearing in the scope of a negative indefinite. Adopting the decomposable analysis of negative indefinites such as *geen* ‘no(ne)’ or *niks* ‘nothing’ (cf. Jacobs 1980; Rullmann 1995; Zeijlstra 2011), which is that they are decomposed into both an abstract negation NEG and an existential quantifier, the authors hypothesise that children shortly after the age of four reanalyse *hoeven* as having an abstract negation in its underlying representation: [HOEF NEG]. This NEG can either be phonologically realised as the sentential negative marker *niet* or be spelled out as a negative part(icle) decomposable from negative indefinites like *niemand* (NEG-body) (Rullmann 1995; Zeijlstra 2011) or other negative expressions such as *weinig* (NEG-many) and *alleen* (NEG-other than) (Iatridou and Zeijlstra 2013; Penka 2011; Penka and Zeijlstra 2005; Von Stechow and Iatridou 2003).

The incorporation of an abstract negation into the underlying representation of *hoeven* generates all possible licensing environments for this NPI as introduced at the beginning of the paper (see again (3) and (4)). This accounts for why, according to Lin et al., the acquisition of *hoeven* only exhibits two stages and children do not need to further reanalyse the NPI after establishing the abstract grammar as [HOEF NEG].

Nevertheless, what children produce in their spontaneous speech does not always reflect the range of their grammatical knowledge. This signifies a methodological disadvantage of Lin et al.’s exploration of the acquisition of this modal NPI. Because the research is corpus-based, the authors are not able to assess children’s knowledge of the licensing of the NPI but only their production in that respect. For instance, Lin et al. do not attest that Dutch children – independent of their ages – use *weinig* to license *hoeven*. However, the absence of *hoeven* in the scope of this Downward Entailing operator cannot exclude the possibility that the children have already acquired *weinig* as a proper licenser of the NPI but they simply do not (yet) produce *hoeven* in the scope of *weinig* in their spontaneous speech. Therefore, before any exclusive conclusion can be drawn, the learning path [HOEF NIET] to [HOEF NEG] must be examined in experimental research – as the authors themselves also point out in discussing their corpus data.

3 Method

Above we presented two acquisitional hypotheses of the Dutch modal NPI attested in the literature: Van der Wal (1996) and Lin et al. (2015). An exclusive conclusion can hardly be drawn, however, as Van der Wal’s hypothesis is confronted with counterevidence and Lin et al.’s learning path is established on the basis of corpus findings only. Therefore, to further evaluate these studies, and to account for the learnability problem of this NPI, we conducted an elicited imitation task with 133 monolingual Dutch children aged between 2;09 and 5;10.

In an elicited imitation task, a child is required to first listen carefully to (pre-recorded) stimuli and then repeat the stimuli as exactly as they heard it (Lust et al. 1996; Vinther 2002). When the child repeats a stimulus precisely as was heard, she/he is claimed to construct her/his own mental representation of it according to her/his own grammatical rules acquired thus far (Chomsky 1964; Eisenbeiss 2010; Keenan and Hawkins 1987; Panitsa 2001; Scholl and Ryan 1980). If a stimulus sentence is grammatical according to the child's own grammatical system, she/he repeats the stimulus immediately after hearing it (Scholl and Ryan 1980). On the other hand, if a stimulus is ungrammatical based on her/his current grammar of the target language, then the participant either corrects it in accordance with her/his own grammar, shows a delay in repetition, or does not repeat it at all (Brown 1973; Kenney and Wolfe 1972; Panitsa 2001; Vinther 2002).

To avoid the possibility of children giving a repetition response from memory alone without first establishing their own mental representations of a stimulus, the length of stimuli in an elicited imitation task must be controlled (Montgomery et al. 1978; among others). Stimuli need to be long enough to override children's memory capacity but short enough for comprehension because children must construct their own mental representations of them without omitting too many words. Montgomery et al. (1978), for instance, proposed that stimuli containing six to seven words are short and thus easy for children between four and six years old, whereas those containing nine to ten words are of a medium length and are more difficult for children of the same age range. We opted for the medium length, based on our results from a pilot study (3;03–5;12; N=12).

To keep the participants concentrated and interested in the experiment, we employed visual support by presenting our participants before each stimulus with a picture of familiar cartoon figures on a laptop screen, i.e. Winnie the Pooh and his friends. We developed our stimuli after selecting or designing the pictures, with the hope of ensuring that each picture conveyed as much of the corresponding stimulus as possible.

4 Experiment

4.1 Participants

A total of 133 monolingual Dutch children participated (2;09–5;10; mean=4;04; SD=9.3 months), recruited via day care centres and primary schools in the Netherlands. One of the 133 children was removed from our dataset because she never repeated the target NPI *hoeven* in her responses, regardless of its licensing environments.

4.2 Procedure

The experiment was conducted individually and took place at educational institutions, either in a quiet corner of the child's classroom (for younger children) or in a room next to the classroom (for most older children). We

52 Acquiring Negative Polarity Items

first invited a child from a class for a game and then introduced the four figures in our experiment, explaining how the game would proceed and what we expected her/him to do. Each child underwent four trials to become familiar with the experimenter and the experiment. If the child proved to understand what was expected of her/him after the trials, the experiment started. Two experimenters were present during the experiment: one for testing the child and the other for recording the child's responses and keeping notes. The experiment lasted an average of fifteen minutes for the four-year-olds, while the younger participants took five minutes more on average.

4.3 Design

In order to examine children's knowledge on *hoeven* licensing in different kinds of negative contexts, we included five Downward Entailing operators: *niet* 'not', *geen* 'no(ne)', *niemand* 'nobody', *weinig* 'few', and *alleen* 'only'. The reason for this selection is twofold. First, they represent different types of negative contexts (see the background section). Second, they convey different frequency information of *hoeven* licensing in child-directed speech: *niet* licenses *hoeven* approximately 80.8% of the time (299 out of 370); *geen* licenses *hoeven* around 10.8% of the time (40 out of 370); *alleen* hardly appears as a *hoeven* licenser in the input, i.e. about 0.1% of the time (4 out of 370); and *niemand* or *weinig* are hardly ever attested as *hoeven* licensers in child-directed speech.⁹ Such a manipulation enabled us to examine the contribution of both the semantic knowledge of different negative contexts and input frequency to the acquisition of the NPI. In order to test whether children had acquired that *hoeven* cannot appear in simple affirmative contexts as in (3), we added an unlicensed test condition by placing *hoeven* in simple affirmative sentences.

A total of twenty fillers were employed in the experiment. To neutralize the effect of every test stimulus containing the same modal verb *hoeven*, half of the fillers contained a modal verb as well, of which six involved *willen* 'will' and four involved *kunnen* 'can'. Both modal verbs are polarity insensitive: they are neither NPIs like *hoeven* nor PPIs (Positive Polarity Items) like *moeten* 'must' (cf. Iatridou and Zeijlstra 2013). Moreover, we counterbalanced the semantic environments of the fillers. Since the majority of the test stimuli containing the NPI *hoeven* were negative, half of the fillers were manipulated to be negative as well, introduced by *niet*, *niks*, or *niemand*. An overview of the experimental conditions is provided in Appendix H.

4.4 Stimuli

All of our stimuli – both the test items and the fillers – contain ten words. As mentioned already, this length was selected based on the criteria of Montgomery et al. (1978) and the results of our own pilot study. Words appearing in the stimuli were attested in daily communication with children

⁹ Data adopted from Lin et al. (2015: Appendix 5).

below approximately five years old. To ensure that the stimuli were of similar syntactic complexity, we only used main clauses.

Below we present some examples of our stimuli. In (5), we present examples of *hoeven* licensed by *geen* or *weinig*; in (6), we show an example of unlicensed *hoeven*. Two examples of grammatical fillers – one with a modal and the other without – are presented in (7a) and (7b), respectively.

- (5) a. Voor het feest vandaag hoeft Beer geen liedje te oefenen.
for the party today needs Pooh no song to practice
Lit.: 'Pooh needs to practice no songs for the party today.'
'Pooh does not need to practice any songs for the party today.'
- b. Knorretje hoeft weinig bloemen van de grond op te rapen.
Piglet needs few flowers from the ground to pick up
'Piglet needs to pick up few flowers from the ground.'
- (6) * Beer hoeft samen met zijn vriendjes mooie liedjes te zingen.
Pooh needs together with his friends nice songs to sing
Intended: 'Pooh needs to sing nice songs together with his friends.'
- (7) a. Beer en Knorretje kunnen heel leuk met zijn tweetjes spelen.
Pooh and Piglet can very nice with their two play
'Pooh and Piglet can play with great fun with the two of them.'
- b. Met het koudeweer draagt Beer alleen een blauwe sjaal.
with the cold weather wears Pooh only a blue scarf
'With the cold weather, Pooh only wears a blue scarf.'

In order to ensure that the participants' performance was not influenced by how the stimuli were presented, we pre-recorded the stimuli in an MP3 recorder with a middle-aged, female native Dutch speaker. To minimise any phonological or prosodic influence, the speaker was required to record the stimuli as naturally and neutrally as possible. The order of the presentation of the stimuli was counterbalanced.

4.5 Scoring: categorisation of the responses

While one experimenter tested the child, the other experimenter wrote down in a score sheet some critical changes or corrections in the child's responses to the stimuli, when applicable. Additionally, we recorded the child's responses on an MP3 recorder for later transcription and analysis.

Children's responses to the stimuli were divided into three main categories: *no response*, *repetition response*, and *non-repetition response*. We assigned the value of 1 to all *repetition responses* and 0 to all *non-repetition responses* as well as in cases of *no response*. The category of *no response* covers the instances in which the child either did not give any response at all after hearing a stimulus or gave an irrelevant response such as *Ik weet het niet* 'I don't know' or *Heb 'm niet gehoord* 'I didn't hear it'.

The category of *repetition responses* refers to responses in which the participants repeated the manipulated stimuli. However, as we controlled

54 Acquiring Negative Polarity Items

the length of the stimuli such that the participants needed to first establish their own mental representations of the stimuli, it was hardly ever the case that the participants were able to repeat every word in a stimulus. We therefore focused only on how the participants reacted to the licensing of *hoeven* and defined *repetition* in the current study as follows. It refers to children's responses in which at least both the NPI *hoeven* and the manipulated licenser were repeated. Moreover, since the aim of the current research lies in the acquisition of the NPI, we also disregarded errors that are irrelevant to *hoeven* licensing, such as non-target-like use of definite articles or omission of the complementiser *te* 'to'. Following these criteria, (8) falls under the category of *repetition* as responses to a stimulus such as (5a) because it contains the NPI *hoeven* in a correct licensing relation with the manipulated licenser *geen* – although the complementiser *te* is not repeated.

- (8) Voor feest hoeft Beer geen liedje oefenen.
for party needs Pooh no song practice
'Pooh does not need to practice any songs for the party.'

The category of *non-repetition responses* is further divided into three subcategories: *substitution*, *omission*, and *addition*. Consider the test stimulus in (5a) as an example, repeated as (9) below. An instance of *substitution* is counted if the child substituted the manipulated licenser *geen* with another licenser, e.g. *niet* in (10a); substituted the NPI *hoeven* with another verb, e.g. *gaat* 'goes' in (10b); or substituted both the NPI and the manipulated licenser by an alternative, as shown in (10c).

- (9) Voor het feest vandaag hoeft Beer geen liedje te oefenen.
for the party today needs Pooh no song to practice
Lit.: 'Pooh needs to practice no songs for the party today.'
'Pooh does not need to practice any songs for the party today.'
- (10) a. Voor het feest vandaag hoeft Beer niet liedje te oefenen.
for the party today needs Pooh not song to practice
'Pooh does not need to practice songs for the party today.'
- b. Voor het feest vandaag gaat Beer geen liedje oefenen.
for the party today goes Pooh no song practice
'Pooh is not going to practice any songs for the party today.'
- c. Voor het feest vandaag gaat Beer niet liedje oefenen.
for the party today goes Pooh not song practice
'Pooh is not going to practice any songs for the party today.'

A *non-repetition response* is categorised as *omission* if the child omitted the NPI, as shown in (11a); left out the manipulated licenser, as given in (11b); or omitted both of them, as illustrated by (11c). Notice that in case of *omission*, the non-repetition responses are not always ungrammatical with respect to *hoeven* licensing. In fact, only when the child omitted the

manipulated licenser did she/he make an overgeneralisation error of the NPI (see (11b)).

- (11) a. voor het feest vandaag Beer geen liedje oefenen
for the party today Pooh no song practice
'Pooh practice no songs for the party today'
- b.* Voor het feest vandaag hoeft Beer liedje oefenen.
for the party today needs Pooh song practice
Intended: 'Pooh needs to practice songs for the party today.'
- c. voor het feest vandaag Beer liedjes oefenen
for the party today Pooh songs practice
'Pooh practice songs for the party today'

A *non-repetition response* is categorised as *addition* if the child gave a grammatical response by adding a negation to license the NPI while confronted with a stimulus containing unlicensed *hoeven*. Consider here the ungrammatical stimulus in (6), repeated as (12) below. An instance of *addition* is counted if the child gave (13) as a response, in which a negation *niet* is added to license the manipulated unlicensed NPI.

- (12) * Beer hoeft samen met zijn vriendjes mooie liedjes te zingen.
Pooh needs together with his friends nice songs to sing
Intended: 'Pooh needs to sing nice songs together with his friends.'
- (13) Beer hoeft niet samen met zijn vriendjes mooie liedjes te
Pooh needs not together with his friends nice songs to
zingen.
sing
'Pooh does not need to sing nice songs together with his friends.'

In principle, the child could also choose to correct an ungrammatical stimulus by substituting the NPI with another verb (as shown in (14)) or omitting the NPI completely (see (15)). Notice that in these cases, the child's behaviour regarding *hoeven* licensing is adult-like as well.

- (14) Beer wil niet samen met zijn vriendjes mooie liedjes zingen.
Pooh wants not together with his friends nice songs sing
'Pooh does not want to sing nice songs together with his friends.'
- (15) Beer samen met zijn vriendjes mooie liedjes zingen
Pooh together with his friends nice songs sing
'Pooh sing nice songs together with his friends'

5 Results

In order to model the acquisitional pathway of the Dutch NPI *hoeven*, we employed a general linear mixed-effect logistic regression analysis in R for each of the six test conditions, based on the raw experimental results. With the ages of the participants as the independent variable and their repetition scores as the dependent variable, the regression analyses conducted on our cross-sectional data enabled us to generalise the developmental patterns of children's knowledge of the NPI in different (non-)licensing conditions. This section presents the results of the regression analyses. Given the rationale of an elicited imitation task that children are only able to repeat a stimulus if it is in line with their own grammatical system, we interpret the development of children's repetition performance in the current experiment as indicating the development of their grammatical knowledge on *hoeven* licensing.

We start with the licensing condition by the sentential negation *niet* 'not'. The development of children's knowledge on *hoeven* licensing by *niet* predicted by our regression model is presented in the graph below. The x-axis represents the ages of the participants in terms of months, the y-axis indicates the probability of a repetition of the stimuli predicted by the regression model, and the interpolation line in the graph represents the mean value of the predicted probabilities depending on the age.¹⁰

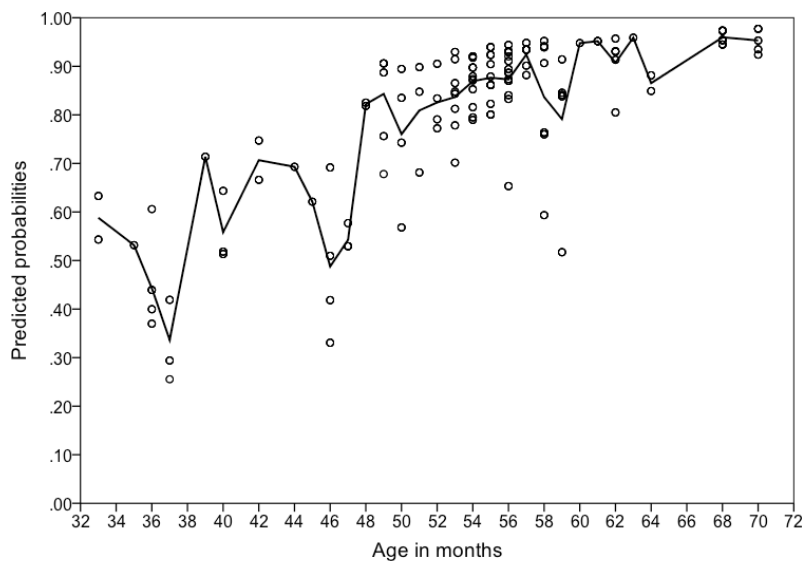


Figure 2: Development of children's repetition probabilities in the licensing condition by *niet* 'not'

¹⁰ In this paper, the term *predicted probabilities* merely refers to the repetition probabilities predicted by the regression analyses.

As is illustrated in Figure 2, Dutch children are predicted to give a repetition response of a stimulus containing *hoeven* licensed by *niet* around 50% of the time at younger ages, i.e. below 3;04 (i.e. 40 months). However, our regression model attests a significant age effect in the development ($p < .001$), which means that children's repetition performance improves significantly with age. In particular, at 5;00 (i.e. 60 months) and older, the predicted probabilities for children's repetition behaviour reach .90 on average.

In the licensing condition by the negative indefinite *geen* 'no(ne)', our regression model predicts a similar developmental pattern (see Figure 3). As shown below, the repetition probabilities predicted for younger children indicate that the participants who were younger than 3;04 (i.e. 40 months) at the test moment are around .50 and that the repetition performance of children is predicted to slightly improve when children are older. For instance, at 5;10 (i.e. 70 months), the predicted probabilities reach .80. The increase from .50 to .80 on average in the predicted probabilities of children's repetition responses is significant, as our model attests a significant age effect for this licensing condition ($p = .00313$).

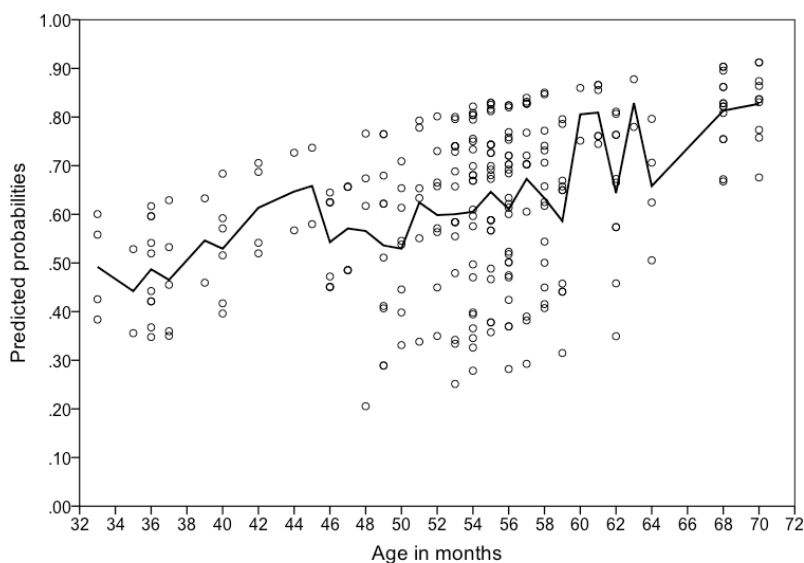


Figure 3: Development of children's repetition probabilities in the licensing condition by *geen* 'no(ne)'

In the other licensing conditions by *niemand*, *weinig*, or *alleen*, however, our regression models predict a distinct acquisitional path. Consider first the graph below for the development of children's knowledge of licensing of the Dutch NPI in the scope of the negative indefinite *niemand* 'nobody'.

58 Acquiring Negative Polarity Items

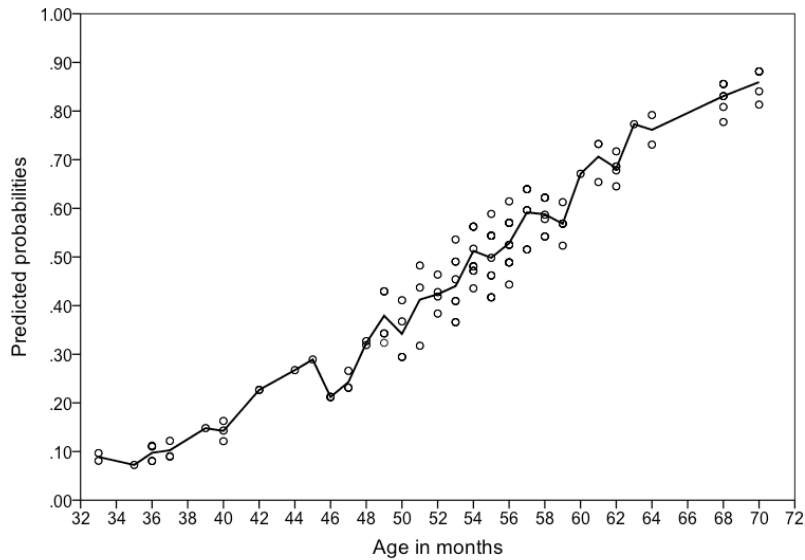


Figure 4: Development of children's repetition probabilities in the licensing condition by *niemand* 'nobody'

Compared to the development predicted for the licensing conditions by *niet* and *geen* (i.e. Figures 2 and 3), it is clear that the development of children's knowledge on *hoeven* licensing by *niemand* exhibits a different pattern. Instead of a starting value at around .50 as predicted for the licensing conditions by *niet* or *geen*, the children's repetition probabilities are predicted to be merely around .10 at 3;04 or younger in the licensing condition by *niemand*. Nevertheless, our regression model predicts a significant increase in the children's repetition probabilities as they grow older ($p < .001$): at 5;10 and older, they are predicted to be able to repeat a stimulus containing *hoeven* licensed by the negative indefinite *niemand* approximately 90% of the time.

Children's knowledge of *hoeven* licensing by the Downward Entailing operator *weinig* 'few' exhibits a similar growth as their knowledge on the licensing of the NPI by *niemand*. This is evident when comparing Figure 4 to the following graph, in which the development in the licensing condition by *weinig* is illustrated.

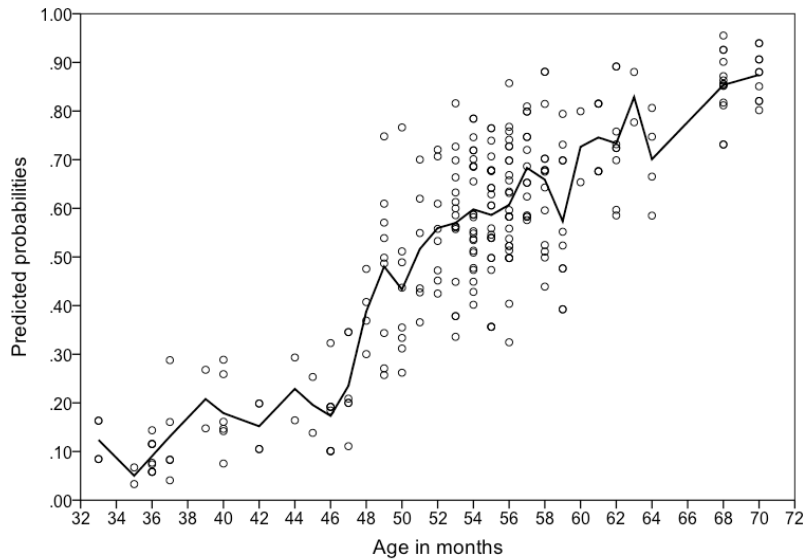


Figure 5: Development of children's repetition probabilities in the licensing condition by *weinig* 'few'

When confronted with stimuli containing *hoeven* licensed by the Downward Entailing operator *weinig*, children below 3;10 (i.e. 46 months) are predicted to give a repetition response merely 15% of the time on average, whereas their older counterparts are predicted to exhibit better repetition performance. For instance, at 4;09 (i.e. 57 months), the predicted probabilities of a repetition response are around .70; and at 5;10 (i.e. 70 months), children's repetition probabilities reach .90. For this licensing condition, our model attests a significant effect of the age of the participants as well ($p < .001$). This means that the repetition performance of our participants is predicted to significantly improve with age.

The last licensing condition that we will present here contains stimuli in which *hoeven* is licensed by the exclusive adverb *alleen* 'only'. The development of children's knowledge on the licensing of *hoeven* by *alleen* predicted by our regression model is demonstrated below.

60 Acquiring Negative Polarity Items

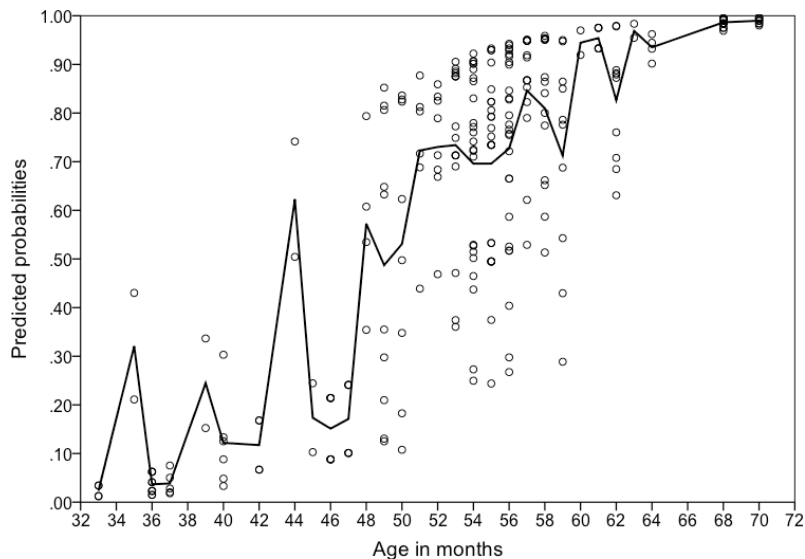


Figure 6: Development of children's repetition probabilities in the licensing condition by *alleen* 'only'

Between 2;09 (i.e. 33 months) and 3;06 (i.e. 42 months), the predicted probabilities of children's repetition behaviour in the licensing condition by *alleen* have an average value of .10. Nonetheless, children's repetition probabilities are predicted to increase significantly with age ($p < .001$), already reaching 1.0 at 5;03 (i.e. 63 months). The significant age effect attested here suggests a substantial growth in children's grammatical knowledge on *hoeven licensing* by the exclusive adverb *alleen*. Although younger children (i.e. those between 2;09 and 4;00) show relatively large individual differences in their repetition performance ($SD = 0.355$), these differences disappear later on ($SD = 0.218$).

The regression results presented in Figures 2 to 6 strongly suggest two kinds of developmental patterns in acquisition, distinguishable when we consider the starting values of the predicted probabilities of children's repetition performance. One pattern covers children's development in the licensing condition by *niet* or *geen*. In both these licensing conditions, our models predict a repetition probability of at least .50 at 2;09, which increases to .90 and .80, respectively, at 5;10. Another pattern signifies the development in the licensing condition by *niemand*, *weinig*, or *alleen*. Although in these licensing conditions, our models predict a repetition probability of at least .90 at 5;10, as well as for the licensing condition by *niet* or *geen*, the starting values of the predicted probabilities are merely .10 in the licensing condition by *niemand* or *weinig* and even less than .05 in the licensing condition by *alleen*.

Recall the rationale of an elicited imitation task that children are only able to repeat a stimulus if it is in line with their own grammatical system.

The two developmental patterns described above thus represent the following learning path of the Dutch NPI from the ages of approximately three to six. Children start out with a grammar that only generates *hoeven's* appearance in the scope of the sentential negative marker *niet* or the negative indefinite *geen* and further develop their grammar towards an adult-like direction such that the grammar at later ages also allows the NPI to be licensed by other Downward Entailing operators, namely *niemand*, *weinig*, and *alleen*.

We now move on with the development predicted by our regression model for the unlicensed test condition, which is presented in the graph below.

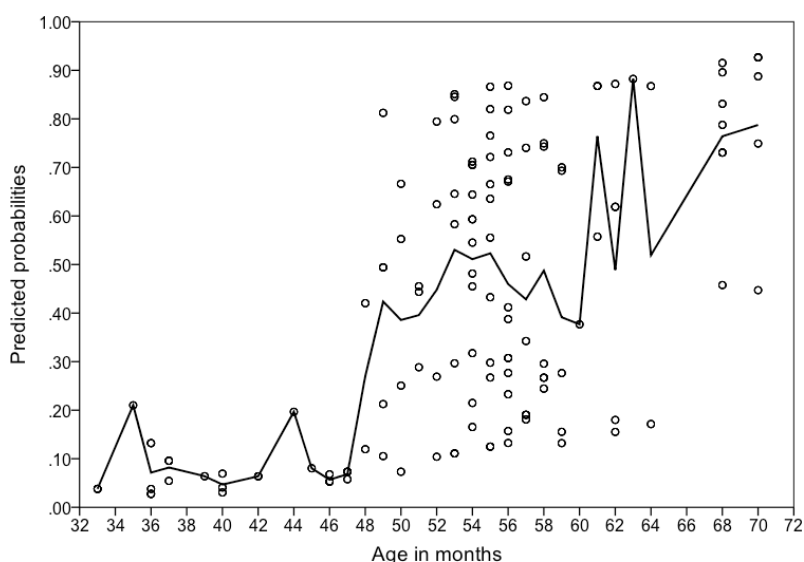


Figure 7: Development of children's repetition probabilities in the unlicensed test condition

At first sight, the development in the unlicensed test condition predicted by our regression model seems to exhibit a similar path as that predicted for the licensing condition by *niemand*, *weinig*, or *alleen*. In these four test conditions, the repetition probabilities are predicted to be extremely low at 2;09 (i.e. 33 months) but increase to at least .80 at 5;04 (i.e. 64 months). Nonetheless, the development attested in the licensing conditions by *niemand*, *weinig*, and *alleen* are all akin to a linear pattern, whereas the development predicted for the unlicensed test condition appears to be much less linear but rather exhibits three stages. In particular, between 2;09 and 4;00, the predicted probabilities of the repetition performance are extremely low, i.e. merely .08 on average. The repetition probabilities nevertheless increase to approximately .47 between 4;00 and 5;00, while after 5;00, children are even predicted to be able to repeat the ungrammatical stimuli

62 Acquiring Negative Polarity Items

around 68% of the time. In the discussion we will come back to this point and demonstrate that the difference with respect to the linearity observed here represents different reasons underlying the increase in children's repetition scores.

As for the other five licensing conditions, our model also shows a significant age effect in the unlicensed test condition ($p < .001$). However, given the rationale of an elicited imitation task – namely that participants are only able to repeat a stimulus if it is in line with their own grammar – the significant increase attested in the unlicensed test condition seems to suggest development in a non-adult-like direction. That is, children start out with a strict grammar that only allows *hoeven* to appear in the scope of a certain negation but switch to a tolerant grammar that even allows *hoeven* to appear without a licenser, which is ungrammatical according to the adult grammar of Dutch. As we will discuss in the next section, however, the significant increase predicted for children's repetition performance in the unlicensed test conditions must be explained as a consequence of the older children's better working memory capacity. Thus, the non-target-like development is not problematic for learning hypotheses of the Dutch NPI.

6 Discussion

The regression results presented in the previous section clearly lead to three kinds of developmental patterns: the pattern predicted for the licensing condition by *niet* or *geen*; the learning path modelled for the licensing conditions by *niemand*, *weinig*, and *alleen*; and the developmental pattern predicted for children's knowledge on *hoeven* licensing when the NPI is uttered in the absence of a licenser. We now proceed with interpreting these patterns against the two previous studies on the acquisition of the Dutch NPI that we briefly introduced in the background section: Van der Wal (1996) and Lin et al. (2015).

As we will argue in this section, the developmental pattern attested for the licensing conditions by *niet* and *geen* (i.e. the *niet-geen* pattern) is exactly what the acquisitional path proposed in Van der Wal (1996) predicts. Although this pattern does not directly follow from Lin et al.'s learning path, it need not challenge Lin et al. (2015) under an assumption of a second lexical frame in early child language ([HOEF GEEN]). However, the developmental pattern observed for the licensing conditions by *niemand*, *weinig*, and *alleen* (i.e. the *niemand-weinig-alleen* pattern) is only compatible with the learning path hypothesised in Lin et al. (2015). Finally, we will discuss the development towards a non-adult-like direction put forward by our regression results in the unlicensed test conditions. We will show that this developmental pattern turns out to not be problematic for Van der Wal (1996) and Lin et al. (2015), since it can be explained by a grammar-external factor: the better working memory capacity of the older children that participated in the current experiment.

6.1 The *niet-geen* pattern

The development predicted for the licensing condition by the sentential negative marker *niet* and the development predicted for the licensing environments by the negative indefinite *geen* exhibit a similar pattern. This is represented in Figure 8. In particular, children are predicted to be able to repeat stimuli containing *hoeven* in the scope of *niet* or *geen* already 50% of the time on average at 2;09 (i.e. 33 months). Moreover, for both the licensing conditions, our models predict children to give a repetition response at least 80% of the time at 5;04 (i.e. 64 months) or older. We interpret such regression results here as evidence that children as early as 2;09 have already acquired that the Dutch NPI is allowed to appear in the scope of both the sentential negation *niet* and the negative indefinite *geen*. We will show later in this subsection that the lower repetition probabilities at younger ages, which are on average merely .613 and .534 below 4;03 (i.e. 51 months) in the licensing conditions by *niet* and *geen*, respectively, are explained by the younger children's limited working memory capacity.

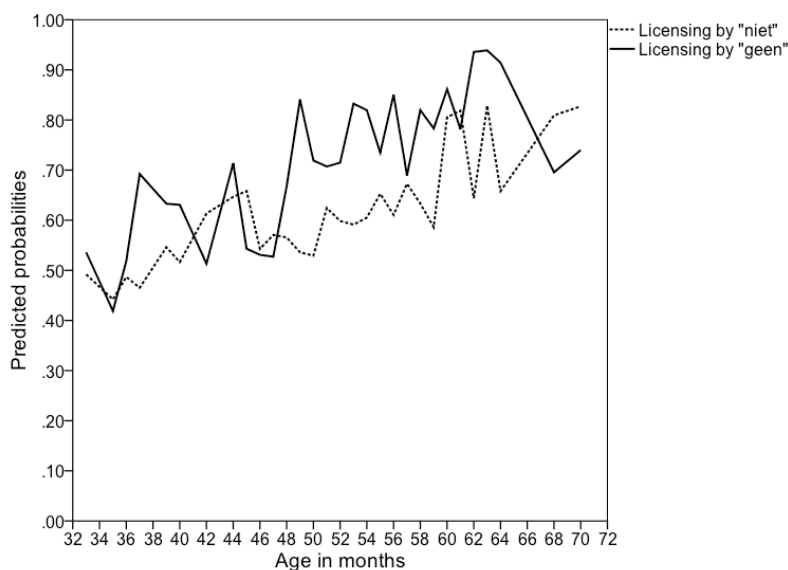


Figure 8: The similar development in the licensing conditions by *niet* and *geen*

The *niet-geen* pattern provides evidence for the acquisitional pathway hypothesised in Van der Wal (1996). According to Van der Wal, the acquisition of NPIs such as *hoeven* is determined by the order in which the acquisition of different negative operators takes place. As shown by the corpus data reported in Van der Wal (1996: Table 4.1), the average age of emergence of the sentential negative marker *niet* is 1;10, while that of *geen* is 2;04. If we assume that the average age of emergence also indicates the age at which children have acquired the negations, we come to the

64 Acquiring Negative Polarity Items

conclusion that children have already acquired both *niet* and *geen* at 2;09, which represents the age of our youngest participants in the current experiment. It is therefore far from surprising that the repetition probabilities of the younger participants, those below 4;04 (i.e. 52 months), are predicted to be already around .60 on average. Moreover, the similar development of children's repetition behaviours in both the licensing condition by *niet* and the licensing condition by *geen* seems to indicate a similar kind of knowledge underlying *hoeven*'s appearance in the scope of *niet* or *geen* in the child grammar. Since Van der Wal assumed that the NPI status of *hoeven* is part of children's innate linguistic awareness, we may interpret that similar kind of knowledge as a form of innate grammatical knowledge.

As for Lin et al. (2015), however, the developmental pattern predicted for the licensing condition by *niet* and the licensing condition by *geen* turns out to be problematic at first sight. These authors propose that Dutch children below the age of four have only established the lexical dependency between the NPI *hoeven* and the sentential negative marker *niet*, i.e. they have only developed the lexical frame [HOEF NIET]. Therefore, their learning path predicts children to have relatively high repetition probabilities only in the licensing condition by *niet*. Since *hoeven*'s appearance in the scope of the negative indefinite *geen* is generated by the abstract analysis [HOEF NEG], which – according to Lin et al. – is not established until shortly after the age of four, we do not see how they can explain the similar developmental patterns attested for both the licensing conditions by *niet* and *geen* as illustrated in Figure 8.

Adopting Lin et al.'s learning path of the NPI from [HOEF NIET] to [HOEF NEG], a possible explanation in this respect is to assume that [HOEF NIET] is not the only lexical frame in early child language. Recall that the lexical frame [HOEF NIET] is established exclusively based on input evidence that *hoeven* co-occurs with the sentential negation within a distance of three syllables around 80% of the time (which equals a daily input frequency of nine) (cf. Lin et al. 2015). We may therefore consult the frequency of *hoeven* and *geen* co-occurring within a distance of three syllables in the language input to investigate the possibility of assuming a second lexical frame in early child Dutch, i.e. [HOEF GEEN].

Lin et al. report that of the remaining 21% of language input, 11% contains *hoeven* appearing in the scope of *geen* within a distance of three syllables (which amounts to one such utterance per day in the input), and 7% contains the NPI co-occurring with other licensers within three syllables, such as *niks* 'nothing' and *maar* 'only'.¹¹ The authors do not consider the 11% co-occurrence frequency of *hoeven* and *geen* within a distance of three syllables to be sufficient for children to establish a lexical dependency between the two words. Nevertheless, there is no reason to exclude the possibility of [HOEF GEEN] as a lexical frame in early child Dutch either.

¹¹ The remaining 3% of the input are utterances in which the co-occurrence of *hoeven* and a licenser exceeds three syllables (Lin et al. 2015: Appendices 6 and 7).

Following this line of reasoning, we assume here that younger children have established two lexical frames for the Dutch NPI: [HOEF NIET] and [HOEF GEEN]. If we assume that lexical frames are part of the mental lexicon and can be retrieved in the same way as single lexical items, it logically follows that children at younger ages are expected to be able of repeating both the stimuli containing the NPI in the scope of *niet* and those containing *hoeven* licensed by *geen*. This is what our models predict. Thus, adopting the lexical frame [HOEF GEEN] next to [HOEF NIET] in early child language solves the problem.

However, the significant increase in children's repetition probabilities attested for both the licensing condition by *niet* and that by *geen* does not appear to be a predicted outcome for either Van der Wal or Lin et al. Following Van der Wal, the awareness of *hoeven* being an NPI is already available from the acquisitional onset. Therefore, children should be able to repeat a stimulus containing *hoeven* in the scope of an acquired negation at approximately the same rate, independent of age, rendering the significant increase in children's repetition performance over time as unpredicted. On the other side, the mere assumption that both [HOEF NIET] and [HOEF GEEN] are the possible lexical frames in early child Dutch (à la Lin et al.) cannot capture the significant increase in children's repetition performance in the two test conditions either. After all, why would the repetition probabilities increase if children have once established the relevant lexical frames, which are part of their mental lexicon?

We interpret the significant improvement of children's repetition performance in the relevant licensing conditions as a consequence of the development of children's working memory capacity. As participants in an elicited imitation task are required to repeat a stimulus as exactly as is heard, better working memory capacity gives rise to better repetition performance (cf. Montgomery et al. 1978; see also Eisenbeiss 2010). This accounts for the higher repetition probabilities of the older children in our elicited imitation task, suggesting that neither Van der Wal (1996) nor Lin et al. (2015) is challenged.

The explanation with respect to the participants' working memory capacity is confirmed when we compare the younger children's repetition performance in the licensing conditions by *niet* and *geen* and their repetition behaviour when confronted with our filler stimuli. Recall that the current elicited imitation task distinguishes two kinds of fillers: fillers that contain a polarity-insensitive modal verb (such as *kunnen* 'can' or *willen* 'will') with or without negation and those that contain a general lexical verb, such as *dragen* 'wear' (cf. (7a–b)). Here we focus on the filler stimuli with a polarity-insensitive modal verb because they share the same linguistic structure as our test stimuli containing the NPI modal verb *hoeven*. In particular, both types of stimuli contain two verbs: a modal verb – either the NPI modal *hoeven* or a polarity-insensitive modal *kunnen* or *willen* – and a generic lexical verb, such as *oefenen* 'practice', *oprapen* 'pick up', or *zingen* 'sing' (cf. (5) and (7a)). The table below presents the average repetition rates of the younger participants (the three-year-olds) when confronted with different test

66 Acquiring Negative Polarity Items

and filler stimuli in which both a modal and a lexical verb are manipulated. Here we follow the criteria mentioned previously in the experiment section: *repetition responses* refer to instances in which at least the manipulated modal verb and the manipulated negation – if applicable – are repeated.

Condition	Manipulation	Repetition rate	Number of stimuli
Test	<i>hoeven</i> licensed by <i>niet</i>	48.1%	108
	<i>hoeven</i> licensed by <i>geen</i>	51.9%	54
Filler	<i>kunnen</i> in positive contexts	43.2%	54
	<i>kunnen</i> in the scope of <i>niet</i>	59.3%	54
	<i>willen</i> in positive contexts	48.1%	81
	<i>willen</i> in the scope of <i>niet</i>	56.8%	81

Table 1: Average rate of repetition of the three-year-olds in the licensing conditions by *niet* and *geen*, and in the filler condition containing a polarity insensitive modal

The repetition performance reported in the table above show that the three-year-olds exhibit similar rates of repetition in different test and filler conditions, which is approximately 50% on average. A further analysis of these data confirms this, as there is no significant difference attested between the younger participants' repetition rates in different test and filler conditions ($F(5,439)=.712$, $p=.615$). Even when we only focus on the filler stimuli in which a polarity-insensitive modal verb is manipulated in the scope of the sentential negation, which means that the only difference between these filler stimuli and our test stimuli in the licensing condition by *niet* or *geen* is the modal verb, we still do not find any significant difference ($F(3,285)=.446$, $p=.720$).

These results strongly suggest that the presence of the NPI *hoeven* in the two test conditions does not cause any significant difference in the three-year-olds' repetition behaviour in different test and filler conditions. This indicates that the three-year-olds' relatively low repetition rates in the above-listed test and filler conditions are explained by a factor that is irrelevant to (children's knowledge on) *hoeven* licensing. Given what we have discussed thus far, we take this factor to represent the younger children's relatively small working memory capacity. Hence, the significant increase in children's repetition probabilities predicted by our regression models for the licensing conditions by *niet* and *geen* is explained as a consequence of older children's better working memory capacity.

6.2 The *niemand–weinig–alleen* pattern

The regression results suggest that the development predicted for children's repetition performance in the licensing conditions by *niemand*, *weinig*, and *alleen* represents a similar pattern. This is illustrated in Figure 9. For these three licensing environments, our models predict a gradual acquisitional process in which the predicted repetition probabilities increase from (lower

than) .10 at 2;09 (i.e. 33 months) to at least .80 on average at 5;06 (i.e. 66 months) (see Figure 9). Although the predicted probabilities in the licensing condition by *alleen* turn out to have larger individual differences when children are younger than 4;02 (i.e. 50 months) (SD=0.355) than those in the licensing condition by *niemand* (SD=0.230) and *weinig* (SD=0.263), the general developmental trend observed for these three licensing environments is obvious.

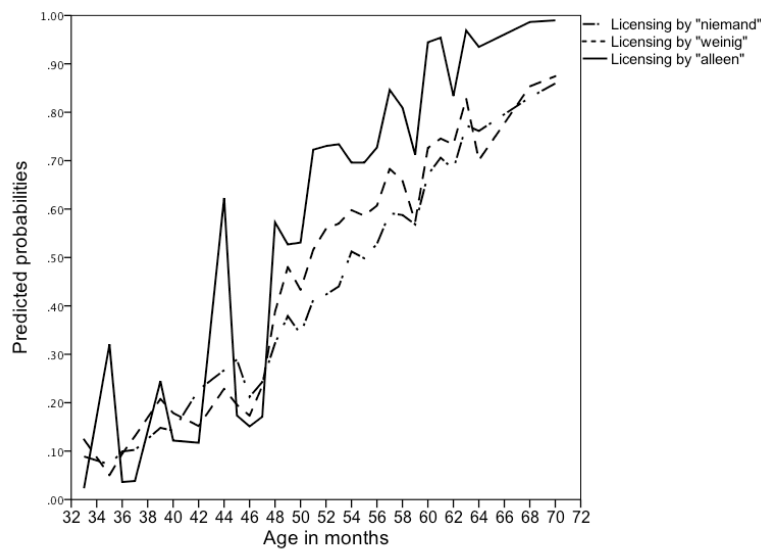


Figure 9: The similar development in the licensing conditions by *niemand*, *weinig*, and *alleen*

The results obtained in the licensing conditions by *niemand*, *weinig*, and *alleen* strongly suggest that the development in children's repetition probabilities on the NPI in these licensing conditions underlies a similar kind of knowledge. In terms of Van der Wal, this similar kind of knowledge refers to children's lexical knowledge of the three negative operators (i.e. *niemand*, *weinig*, and *alleen*), since she proposed that the learning path of the NPI *hoeven* is determined by the acquisition of different Dutch negations. On the other hand, Lin et al. argue that *hoeven*'s appearance in the scope of *niemand*, *weinig*, or *alleen* is generated by the single abstract analysis [HOEF NEG], as these negations all have an incorporated abstract negation; the same kind of knowledge can therefore only indicate children's acquisition of [HOEF NEG] as part of their grammar in late stages. Obviously, the two previous acquisitional hypotheses allow different interpretations of the *niemand*–*weinig*–*alleen* pattern observed in the current experiment. In the remainder of this subsection, however, we demonstrate that this developmental pattern is only compatible with the learning path proposed in Lin et al.

68 Acquiring Negative Polarity Items

We begin by evaluating Van der Wal's proposal against the regression data. Because the age at which Dutch children acquire different negative expressions is crucial to interpreting the developmental pattern, we present the average ages of emergence of *niemand*, *weinig*, and *alleen* in child Dutch development as reported in Van der Wal (1996; Table 4.1), which are 2;09, 3;02, and 2;06, respectively. Recall the average ages of emergence of *niet* and *geen*, which are 1;10 and 2;04, respectively. Under the assumption that the average age of the emergence of a negation in child Dutch development also indicates the age at which children acquire that negation, we come to two predictions for the children's repetition behaviour in the current elicited imitation task.

First, the children's repetition performance in the licensing conditions by *niet*, *geen*, *niemand*, and *alleen* are predicted to be similar, independent of their ages. For instance, Van der Wal's learning hypothesis allows us to expect a similar starting value of the repetition probabilities for all four of these licensing conditions. This is because the relevant negative operators are all acquired at or even before 2;09 (i.e. 33 months), the lower age boundary included in the current experiment. Second, given that *weinig* is the latest acquired negation among the five, with an average age of emergence at 3;02 (i.e. 38 months), the development of children's repetition probabilities in this licensing condition is expected to exhibit a delay. This means that for the current experiment, Van der Wal's learning hypothesis predicts a *niet-geen-niemand-alleen* pattern on the one hand and a delayed *weinig* pattern on the other.

However, this is not what our experimental results suggest. We do not find a similar developmental pattern for the licensing conditions by *niet*, *geen*, *niemand*, and *alleen*. Instead, as is clearly illustrated in Figures 8 and 10, the developmental path in the licensing conditions by *niemand* and *alleen* differs substantially from that predicted by our regression models for the test condition containing *niet* or *geen*. Moreover, the development of children's knowledge on *hoeven* licensing in the scope of *niemand* or *alleen* exhibits a similar pattern to that attested for the licensing condition by *weinig*. Under Van der Wal's hypothesis, this is unexpected because the development in the licensing condition by *weinig* should show a delay due to the latest-acquired status of this negation.

On the other hand, given Lin et al.'s learning path in which children are hypothesised to establish an abstract analysis [HOEF NEG] at late stages, the developmental similarities attested among the licensing conditions by *niemand*, *weinig*, and *alleen* appear to be a predicted outcome. Under the assumption that the abstract analysis [HOEF NEG] is established after children have established the lexical frame(s), we can explain why the development of children's repetition probabilities predicted for the test conditions by *niemand*, *weinig*, and *alleen* has a much lower starting value than those predicted for the licensing context introduced by *niet* or *geen*. This difference is namely interpreted as indicating a delayed development of children's knowledge on *hoeven* licensing by *niemand*, *weinig*, and *alleen* – accounted for by the later acquisition of [HOEF NEG]. Moreover, the assumption of the

abstract analysis [HOEF NEG] allows us to explain why the development of children's knowledge of *hoeven* licensing by *niemand*, *weinig*, and *alleen* proceed simultaneously. Since *niemand*, *weinig*, and *alleen* can each be analysed as containing a decomposable negation NEG, the abstract analysis [HOEF NEG] – though acquired later – can explain *hoeven*'s appearance in the scope of any of these licensors.¹² For Lin et al., it is therefore far from surprising to observe a similar developmental pattern of children's knowledge on *hoeven* licensing in the relevant licensing conditions (see again Figure 9).

The assumption that the development of children's knowledge on *hoeven* licensing in the scope of *niemand*, *weinig*, and *alleen* is explained by one and the same abstract analysis [HOEF NEG] is further confirmed when we look at the correlations among the repetition probabilities in each of these licensing contexts. The correlation data are given below.

Licenser	<i>niemand</i>	<i>weinig</i>	<i>alleen</i>
<i>niemand</i>	1.00		
<i>weinig</i>	0.88 (<i>p</i> <.000)	1.00	
<i>alleen</i>	0.81 (<i>p</i> <.000)	0.83 (<i>p</i> <.000)	1.00

Table 2: Correlation coefficients among children's performance in the licensing conditions by *niemand*, *weinig*, and *alleen*

As presented in the table, there are significantly strong correlations among children's repetition performance predicted by our regression models for these three licensing conditions. These correlation data suggest that *hoeven*'s appearance in the scope of *niemand*, *weinig*, or *alleen* has exactly the same status in children's own grammar. Adopting Lin et al.'s learning path, this same status amounts to *hoeven*'s occurrence in the corresponding licensing conditions being generated by one and the same abstract analysis. This provides evidence for the existence of [HOEF NEG] in late child Dutch.

The correlation data presented in Table 2 also has an implication for Zwarts' theory of polarity licensing (cf. Zwarts 1981, 1986, 1998). As introduced in the background section, negative contexts – which are Downward Entailing contexts in terms of Ladusaw (1979) – are categorised into three types depending on their logico-semantic behaviours: Anti-Morphic contexts, Anti-Additive but not Anti-Morphic environments, and Downward Entailing but not Anti-Additive contexts. Such a categorisation, however,

¹² Due to space limitations, we refer the reader for the relevant decomposable analyses of *niemand*, *weinig*, and *alleen* to Penka (2011, 2012) and Zeijlstra (2011), Horn (1996) and Iatridou and Zeijlstra (2013), and Von Stechow and Iatridou (2003), respectively.

70 Acquiring Negative Polarity Items

does not turn out to be crucial or necessary for the acquisition of the Dutch NPI, given what we have observed in the current experiment.

The negative indefinite *niemand* is an Anti-Additive operator, whereas *weinig* and *alleen* are both only Downward Entailing. However, this categorical difference is not reflected in the pace or pattern of the development of children's knowledge on *hoeven*'s appearance in the scope of these licensors. The development predicted by our regression models for the licensing conditions by *niemand*, *weinig*, and *alleen* is rather strongly correlated (see again Table 2). Thus, in spite of the logico-semantic difference between the Anti-Additive operator *niemand* and the Downward Entailing but not Anti-Additive operators *weinig* and *alleen*, children show a similar learning path in all three licensing conditions (see also Figure 9).

On top of this, we also find that the correlation between the repetition behaviour in the licensing conditions by *geen* and *niemand* is much weaker ($r=.48$, $p<.000$). Since both *geen* and *niemand* are Anti-Additive, we would expect a much stronger correlation – if the notion of anti-additivity indeed played a crucial role in the acquisition of the NPI *hoeven*.

Taken together, the correlation results discussed above lead to the conclusion that the distinction between notions such as anti-additivity and downward entailment are irrelevant to the acquisition of the Dutch NPI. Lin et al. already illustrate that the abstract negation NEG gives rise to a restricted distributional pattern of the NPI as is empirically observed with Dutch native speakers (cf. Lin et al. 2015: Appendix 2). We therefore conclude that semantic notions such as anti-additivity and downward entailment are irrelevant to the licensing of this particular NPI as well. Following Lin et al., we argue that *hoeven* is only allowed to appear in Downward Entailing contexts that incorporate this abstract negation, because of its lexical dependency with the abstract negation NEG (cf. Postal 2000). This in turn may explain the distributional difference between the Dutch NPI and English *any*-terms as exemplified at the beginning of the paper.

As a final remark, we briefly discuss the role of input frequency. As presented in the method section, the five Downward Entailing operators included in the current experiment are of different input frequency: *niet* and *geen* are frequently attested as licensors for *hoeven* (80.8% and 10.8%, respectively), whereas *niemand*, *weinig*, and *alleen* hardly ever appear as licensors of *hoeven* in the input (less than 0.1%). However, our regression results in the licensing condition by *niemand*, *weinig*, or *alleen* (see Figure 9) clearly show that the extremely low input frequency does not suppress the development of children's knowledge of the licensing of *hoeven* in the relevant contexts. This challenges any learning approach that is only frequency based, but provides evidence for the abstract analysis [HOEF NEG] at later stages, as hypothesised in Lin et al. Since [HOEF NEG] is established based on children's knowledge of the decomposable analysis of negative indefinites such as *geen* or *niks*, it applies independently of the co-occurrence frequency of *hoeven* with different licensors in the language input.

6.3 Development in the unlicensed test condition

Compared to the two acquisitional patterns discussed so far (the *niet-geen* and the *niemand-weinig-alleen* patterns), the development of children's knowledge on *hoeven*'s distributional constraint manipulated in the unlicensed test condition exhibits a distinct direction. Recall that the stimuli included in this test condition contained *hoeven* appearing in simple affirmative contexts, which are ungrammatical according to the adult grammar. The significant increase in the children's repetition probabilities over time as illustrated below seems therefore to suggest development towards a non-adult-like direction. In particular, it seems that children acquire a tolerant grammar in late stages, even allowing *hoeven* to appear in the absence of a licenser, although they start out with a stricter grammar that bans *hoeven* from simple affirmative contexts.

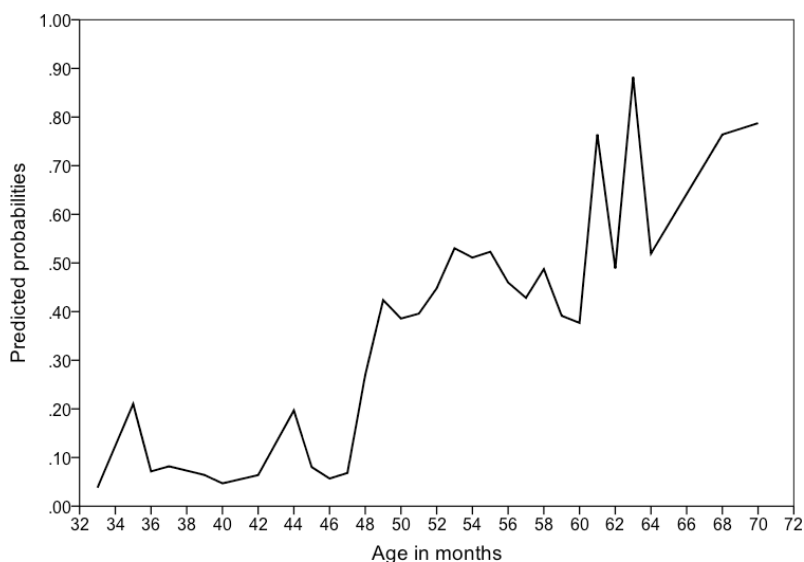


Figure 10: The development in the unlicensed test condition

The development in a non-adult-like direction attested in the unlicensed test condition is unexpected for both Van der Wal (1996) and Lin et al. (2015). As for Van der Wal, children are only expected to repeat a stimulus containing *hoeven* in the scope of an already acquired negation. Unlicensed *hoeven* violates what she referred to as children's awareness of *hoeven*'s sensitivity to the negativity of a sentence. Although the children's awareness of *hoeven*'s NPI-hood is not part of the learning path proposed in Lin et al., unlicensed *hoeven* is disallowed because it is generated by neither the lexical frame [HOEF NIET] nor the abstract analysis [HOEF NEG]. Clearly, both the previous hypotheses predict extremely low repetition probabilities – independent of the children's ages. Does the pattern in Figure 10 then indeed indicate a development of a non-adult like grammar?

72 Acquiring Negative Polarity Items

We assume here that the development illustrated in Figure 10 does not represent a change in children’s knowledge on *hoeven* licensing towards a non-target-like direction but rather is explained as a consequence of older children’s better working memory capacity. As mentioned in the method section, the length of stimuli is crucial to children’s behaviours in an elicited imitation task. To ensure that children (re)construct their own mental representation of stimuli based on their own grammar but do not give a repetition of stimuli from memory alone, stimuli must be sufficiently long to override children’s memory capacity. Nevertheless, to be able to compare the performances of our participants of different ages, we opted for a unified stimuli length of ten words, based on the previous findings of Van der Wal and the results of our own pilot study. If we assume for at least the typically developing children who participated in our experiment that their memory capacity increases with age, it is not impossible that the length of ten words was just too short for the four-year-olds to override their better working memory capacity compared to their younger counterparts, leading to the unexpectedly good repetition performance in the unlicensed test condition at older ages.

However, the current experiment did not contain any procedure for examining the participants’ working memory, which calls for further consideration in this respect. There is nevertheless indirect evidence indicating that the child grammar – independent of age – does not generate the NPI in the absence of a negation. That concerns an asymmetry attested in the grammaticality of the children’s responses while confronted with the stimuli containing properly licensed *hoeven* and those containing unlicensed *hoeven*. The relevant frequency data are presented below.

	Grammatical stimuli Count (%)	Ungrammatical stimuli Count (%)
Grammatical response	1037 (65.5%)	238 (45.1%)
Ungrammatical response	14 (0.9%)	226 (42.8%)
No response	532 (33.6%)	64 (12.1%)
Incomplete response	1 (0.01%)	0
Total	1584	528

Table 3: Frequency of different types of responses in terms of grammaticality¹³

As the table illustrates, when confronted with the ungrammatical stimuli in which *hoeven* appears in the absence of a negation, participants gave both ungrammatical responses signalling a repetition response of the ungrammatical stimuli as well as grammatical responses by correcting the

¹³ We focus here only on the (un)grammaticality with respect to the licensing of the NPI. Other grammatical aspects of the children’s responses, such as errors of grammatical genders or incorrect article choice were disregarded due to the current research aim.

ungrammatical stimuli. In contrast, our participants almost exclusively gave grammatical responses of the stimuli that were themselves also grammatical. This significant asymmetry leads us to the generalisation that the children only produced unlicensed *hoeven* in their response if the stimuli were also ungrammatical ($\chi^2(3, N=2111)=704.618, p<.000$).

Given the rationale of an elicited imitation task that children (re)construct their own mental representation of a stimulus according to their own grammar, the asymmetry strongly suggests that unlicensed *hoeven* is not in agreement with the children's own knowledge on *hoeven* licensing. This further suggests that the child grammar – independent of age – does not generate *hoeven*'s appearance in the absence of a negation; otherwise we would expect the participants to also give ungrammatical responses when confronted with grammatical stimuli in which the NPI is properly licensed.

Further evidence that the child grammar does not allow unlicensed *hoeven* comes from the strategies employed by the children to correct the ungrammatical stimuli when they did not give a repetition response. Among the 238 non-repetition responses to the ungrammatical stimuli (which are also the grammatical responses to the stimuli in the unlicensed test condition in Table 3), three categories can be established, depending on the correcting strategy used by the participants. We find that the participants either add a negation to license the unlicensed NPI manipulated in the stimuli approximately 14% of the time (33 out of 238), substitute the unlicensed NPI by a non-NPI (modal) verb such as *willen* 'will' and *gaan* 'go' circa 63% of the time (149 out of 238), or produce a root infinitive or a phrasal construction by removing the unlicensed NPI from their responses around 23% of the time (56 out of 238). These correcting strategies demonstrate that the participants are indeed aware of *hoeven*'s NPI status: they either add a licenser for the unlicensed NPI or substitute or even remove the unlicensed NPI in their responses. Again, such correcting behaviours of the participants can only be explained under the assumption that the child grammar does not allow unlicensed *hoeven*.

In fact, the CHILDES data reported in Lin et al. (2015) already reveal that monolingual Dutch children do not overuse the NPI in the absence of a negation in their spontaneous speech. Combining these two kinds of acquisitional data, we now conclude that the child grammar does not allow *hoeven* to appear in the absence of a negation at either early or late stages. Thus, the non-adult-like development in the unlicensed test condition (cf. Figure 10) does not necessarily challenge Van der Wal or Lin et al. but is interpreted as a consequence of the development in children's working memory capacity.

This explanation, however, gives rise to a crucial question in understanding the significant improvement of the children's repetition behaviour in the five licensing conditions (cf. Figures 8 and 10). If the significant development observed for the unlicensed test condition is explained by the increase in the children's working memory capacity over time, to what extent can we conclude that the significant increase attested in

74 Acquiring Negative Polarity Items

the children's repetition performance in the five licensing conditions represents not only the children's improved working memory capacity but also a development in the children's knowledge on the NPI as discussed in the previous subsections?

Here we follow Eisenbeiss (2010), who shows that although working memory capacity is one of the factors that can affect children's performance in an elicited imitation task, it cannot explain the differences between different test conditions observed for the same participants. This is because the effect size of working memory should be similar for the same participants, independent of test conditions, which would not lead to any significant difference among different test conditions. In the current experiment, however, we do find a significant difference in the older children's repetition behaviours across different test conditions ($F(5, 2088)=38.288, p<.001$).¹⁴ In particular, the older children's repetition probabilities in the unlicensed test condition are significantly lower than those attested in each of the five licensing conditions: by *niet* ($F(1, 940)=248.723, p<.001$), by *geen* ($F(1, 733)=35.416, p<.001$), by *niemand* ($F(1, 733)=11.388, p=.001$), by *weinig* ($F(1, 732)=31.882, p<.001$), and by *alleen* ($F(1, 734)=72.003, p<.001$).

According to Eisenbeiss (2010), the significant differences attested across different test conditions cannot be accounted for by memory effect, although the older children's repetition performance in our experiment is improved by their better memory capacity compared to their younger counterparts. We therefore conclude that the significant increase in the children's repetition performance attested in the five licensing conditions represents not only the better working memory capacity of the participants but also a development in the children's knowledge on *hoeven* licensing at later ages. This may explain the difference with respect to the linearity of the development observed for the licensing conditions by *niemand*, *weinig*, and *alleen* on the one hand, which attested for the unlicensed test condition on the other, although the developments predicted by our regression models for all four test conditions seem to have a similar starting value at the age of 33 months. Recall that the unlicensed test condition demonstrates a more stage-like development (see Figure 10), whereas the development in the licensing conditions by *niemand*, *weinig*, and *alleen* are all akin to a linear growth pattern.

¹⁴ This ANOVA analysis is employed based on the repetition data of the participants above the age of 48 months. We chose this age as a watershed because it is at this age that the children's repetition probabilities dramatically increase, as can be seen in Figure 10.

7 Conclusion

In this paper we presented experimental data collected from 132 monolingual Dutch children (2;09–5;10) in an elicited imitation task. To explore the learnability of the Dutch NPI, we modelled the developmental patterns of children's knowledge on *hoeven* licensing in six different test conditions by using general linear mixed-effect logistic regression analyses in R. The regression results suggest an acquisitional path in which children start with a strict grammar that only allows *hoeven* to appear in the scope of either the sentential negation *niet* or the negative indefinite *geen* but later switch to a less strict grammar that allows *hoeven* to appear in a wider set of negative contexts, including those introduced by *niemand*, *weinig*, or *alleen*.

This acquisitional path falsifies the learning hypothesis by Van der Wal (1996); and although it does not provide exclusive evidence for the learning path from [HOEF NIET] to [HOEF NEG] as proposed in Lin et al. (2015), an adoption of a second lexical frame [HOEF GEEN] in early child Dutch gives rise to a better explanation of the developmental patterns attested in the current experiment. In particular, the strict grammar of the NPI at early stages contains two lexical frames [HOEF NIET] and [HOEFEN GEEN], established based on the massive (near-)adjacent co-occurrence of *hoeven* with *niet* and *geen* in the input (cf. Lin et al. 2015), whereas the less strict grammar in late child Dutch merely contains an abstract analysis [HOEF NEG]. Because NEG can either be phonologically realised as *niet* or incorporated in *geen* (cf. Jacobs 1980; see also Rullmann 1995; Zeijlstra 2011), the acquisition of [HOEF NEG] renders the two lexical frames established in early stages as redundant. We therefore conclude that the acquisition of the NPI proceeds from two lexical frames [HOEF NIET] and [HOEFEN GEEN] to an abstract analysis [HOEF NEG], for which no innate linguistic knowledge of NPI-hood is necessary.

Concerning the contribution of different kinds of information to the acquisition of the Dutch NPI, we conclude the following based on our experimental exploration. Input frequency only plays a predominant role in constructing the two lexical frames of *hoeven* at the initial stage of acquisition, whereas once Dutch children understand that negative indefinites are decomposable into a negation and an indefinite part the abstract analysis [HOEF NEG] can readily be acquired at the later stage. Semantic notions such as anti-additivity and downward entailment are irrelevant to the acquisition of the Dutch modal NPI at either stage.

76 Acquiring Negative Polarity Items

Chapter IV

Mandarin *shenme* as a superweak NPI*

Abstract

In the past thirty years, Frans Zwarts has written several papers providing crucial insight into licensing contexts for Negative Polarity Items (NPIs), presenting a more nuanced picture than Ladusaw's (1979) Downward Entailing (DE) requirement. Zwarts demonstrated (1981) that a number of Dutch NPIs appear only in a subset of DE-contexts, and proposed (1995) nonveridicality as a logico-semantic property that licenses so-called superweak NPIs. Such superweak NPIs, however, have hardly been attested. We show that Mandarin *shenme* 'a (thing)' is a prototypical superweak NPI. We explain its ungrammaticality in veridical contexts by arguing that *shenme* exhibits a lexical referential deficiency. Acquisitional data, furthermore, suggest that children initially analyse *shenme* as a *wh*-quantifier but acquire the referential deficiency underlying its NPI status after the age of four.

1 Introduction

Negative Polarity Items (NPIs) refer to lexical items that may only appear in some kind of negative contexts. See (1) for such a distribution of an NPI, i.e. English *any*.¹ The NPI is marked in italics.

- (1) a. It is *(not) the case that John saw *any* robins.
b. Nobody/*Somebody saw *any* robins.
c. Few/*Many people saw *any* robins.

Given this distribution, Ladusaw (1979) proposes that NPIs such as English *any* are restricted to Downward Entailing (DE) contexts only – contexts satisfying an entailment relation from set to subset:² under the scope of sentential negation as in (1a), under the scope of negative indefinites as in

* This chapter is adapted from Lin, Jing, Fred Weerman, and Hedde Zeijlstra. (2014). Mandarin SHENME as a superweak NPI. In *Black Book: a festschrift in honor of Frans Zwarts*, 229-251, eds. Hoeksema, Jack, and Dicky Gilbers. Groningen: University of Groningen.

¹ See also Ladusaw (1979) for the distribution of the NPI *any*.

² F is *Downward Entailing*, iff for every arbitrary X and Y, it holds that $X \subseteq Y \rightarrow F(Y) \subseteq F(X)$ (adapted from Zwarts 1998).

78 Acquiring Negative Polarity Items

(1b) and under the scope of semi-negative quantifiers as in (1c).³ However, not all NPIs are licensed in exactly the same set of DE-contexts. As first noticed in Zwarts (1981), Dutch *mals* 'soft' and *ook maar* 'at all', for example, may only appear in certain kinds of DE-contexts (see (2) and (3)).⁴

- (2) a. Deze kritiek is niet *mals*.
 this critique is not mild
 'This critique is not mild.'
- b.* Geen kritiek is *mals*.
 no critique is mild
 Intended: 'No critique is mild.'
- c.* Weinig kritieken zijn *mals*.
 few critiques are mild
 Intended: 'Few critiques are mild.'
- (3) a. Het lukt niet om *ook maar* een vis te vangen.
 it works not to at all a fish to catch
 'It is not (even) possible to catch one fish at all.'
- b. Ik heb nooit *ook maar* een vis gevangen.
 I have never at all a fish caught
 'I have never caught a fish at all.'
- c.* Weinig mensen hebben *ook maar* een vis gevangen.
 few people have at all a fish caught
 Intended: 'Few people have caught a fish'.

On the other hand, the distribution of NPIs like English *any* and Dutch *enig* 'any' even extends beyond DE-contexts, i.e. in polar questions and in complement clauses of non-factive verbs as shown in (4) and (5).⁵

- (4) a. Did you see *any* students?
 b. I guess you saw *any* students.
- (5) a. Heb je *enig* probleem met NPIs?
 have you any problem with NPIs
 'Do you have any problem with NPIs?'
- b. Ik geloof dat je *enig* probleem hebt met NPIs.
 I believe that you any problem have with NPIs
 'I believe that you have any problem with NPIs.'

³ Other DE-contexts are conditional clauses, restrictive clauses of a universal quantifier and comparative clauses, etc.

⁴ For the distribution of the NPI *ook maar* 'at all', see Giannakidou (1997) and Zwarts (1998); for the distribution of the NPI *bijster* 'very', see Van der Wouden (1997) and Zwarts (1998).

⁵ For the distribution of the NPI *any* beyond DE-contexts, see Giannakidou (1998, 1999); for the distribution of the NPI *enig* 'any', see Giannakidou (2010) and Hoeksema (2010).

As to explain NPIs' distribution in different kinds of contexts, Zwarts (1993) proposes that NPIs come about in different strengths depending on the negativity of their licensing conditions. Superstrong NPIs (Dutch *mals*) may only appear in stronger negative contexts such as under the scope of *niet* 'not', i.e. Anti-Morphic contexts;⁶ strong NPIs (Dutch *ook maar*) are restricted to strong negative contexts like under the scope of *niemand* 'nobody' or *zonder* 'without', i.e. Anti-Additive contexts;⁷ weak NPIs (Dutch *ooit* 'ever' and English *any*) are merely licensed in weak negative contexts – DE-contexts.⁸ This suggests that NPIs such as Dutch *enig* are even weaker than *ooit* or *any*, since they may also appear in weaker negative contexts compared to DE-contexts. As to capture the distribution of such weaker NPIs, Zwarts (1995) introduces nonveridicality and claims that nonveridical contexts license NPIs such as *enig*. As nonveridical contexts are the weakest type of negative contexts, we refer to those NPIs of such weaker strength as superweak NPIs in this paper (see also Hoeksema 1994).

Nonetheless, the literature hardly attests any superweak NPIs that are excluded from all veridical contexts. By examining the distribution of Mandarin indefinite *shenme* 'a (thing)' in spoken Mandarin, however, we show that *shenme* is a prototypical NPI of the superweak strength, allowed only in nonveridical contexts. Assuming that *shenme* is lexically deficient in referring, developed from Giannakidou (1998, 1999) and Lin (1996, 1998), we provide an explanation for *shenme*'s grammaticality in nonveridical contexts only. Moreover, by presenting acquisitional data collected in a corpus study in the CHILDES database (MacWhinney 2009), we show that Mandarin children acquire the superweak NPI by initially analysing it as an interrogative indefinite and then reanalyse it as a nonreferential existential quantifier after the age of four.

The paper is structured as follows. Section 2 introduces the definition of nonveridical contexts. Section 3 examines the restricted distribution of *shenme* to different nonveridical contexts in Mandarin Chinese, which leads to the conclusion that *shenme* is a superweak NPI. We establish an analysis of *shenme* in Section 4 that accounts for why this indefinite is only banned from veridical contexts, i.e. being a superweak NPI. Section 5 focuses on language acquisition. We discuss data collected in CHILDES and propose an explanation for how Mandarin children acquire the superweak NPI such that they obtain the knowledge of *shenme*'s referential deficiency in its lexical semantics. Section 6 concludes.

⁶ A function f is *Anti-Morphic*, iff for every arbitrary X and Y , it holds that $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ and $f(X \cap Y) \leftrightarrow f(X) \cup f(Y)$ (adapted from Zwarts 1998).

⁷ A function f is *Anti-Additive*, iff for every arbitrary X and Y , it holds that $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$ (adapted from Zwarts 1998).

⁸ See Hoeksema (1999) for the distribution of *ooit* 'ever' in DE-contexts only.

2 Nonveridical contexts

Zwarts (1995) defines (non)veridicality in terms of truth, see below.

- (6) (Non)veridicality for propositional operators⁹
A propositional operator F is veridical, iff Fp entails p : $Fp \models p$;
otherwise F is nonveridical.

Informally, a veridical context is a context in which the truth of a proposition can be entailed. Complement clauses of factive verbs, for instance, are veridical, since the truth of the proposition (7b) is entailed by (7a).

- (7) a. I know you are busy.
b. You are busy.

On the other hand, a nonveridical context is a context in which the truth of a proposition cannot be entailed. Contexts that exhibit nonveridicality are polar questions, imperatives, complement clauses of non-factive verbs, imperfectives, etc. Polar questions are nonveridical because sentences like (8a) do not entail the truth of (8c). In the same vein, complement clauses of non-factive verbs are nonveridical as well: (8b) does not entail the truth of (8c), either.

- (8) a. Are you busy?
b. I guess you are busy.
c. You are busy

Nonveridical contexts form a weaker type of negative contexts than DE-contexts. As proven in Zwarts (1998), DE-contexts and nonveridical contexts stand in a subset relationship with each other. All DE-contexts are nonveridical but not the other way around.¹⁰ This can also be presented by means of a hierarchy (adapted from Zwarts 1995; see also Hoeksema 1994 and Van der Wouden 1994, 1997).

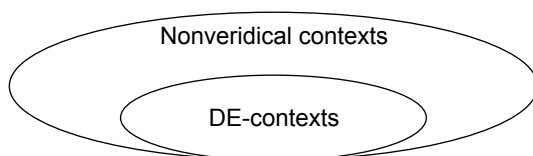


Figure 1: The subset relationship between DE and nonveridical contexts

⁹ Adopted from Zwarts (1986, 1998).

¹⁰ Such a subset relationship also applies to Anti-Morphic contexts, Anti-Additive contexts and DE-contexts. All Anti-Morphic contexts are Anti-Additive but not the other way around, and all Anti-Additive contexts are DE but not vice versa.

3 *Shenme* as a superweak NPI

Traditional Chinese grammars categorised *shenme* as an interrogative pronoun with some non-interrogative functions (Ding 1961; Li 1924; Lü 1982; Zhao 1979; among others). This is because besides its interrogative interpretation as shown in (9a),¹¹ *shenme* may also appear in some non-interrogative sentences functioning as a pronoun of *XuZhi* 'vague reference' in (9b), or that of *RenZhi* 'free choice reference' in (9c) or that of *BudingZhi* 'unspecific reference' in (9d).

- (9) a. Ni zuotian mai le shenme (ne)?¹²
 you yesterday buy PERF *shenme* Q-marker
 'What did you buy yesterday?'
 b. Ta haoxiang shi zai xie shenme.
 s/he probably COP at write *shenme*
 'S/he is probably writing something.'
 c. Shenme shuiguo wo dou ai chi.
shenme fruit I all love eat
 'I love to eat all fruit.'
 d. Wo lai mai xie shu he bi shenme de.
 I come buy some books and pens *shenme* PAR
 'I come here to buy some books, pens and other things like that.'

The facts in (9b) to (9d) led some scholars to conclude that *shenme* can appear as a polarity item in some non-interrogative contexts (Cheng 1994, 1995; Huang 1982). This is supported by the following examples, where a non-interrogative reading of *shenme* is unavailable in simple affirmative clauses as in (10a), in perfectives as given in (10b) or in complement clauses of a factive verb, see (10c) (Lin 1996, 1998; Li 1992; Xie 2007).¹³

¹¹ The term *interrogative sentences* in this paper does not cover polar questions but refers only to those interrogative sentences that are introduced by an interrogative pronoun in a traditional sense, i.e. *shenme*.

¹² In Mandarin Chinese, a Q-marker may be either overt or covert in interrogative sentences (e.g. Ni 2005).

¹³ Cheng (1994, 1995) also observes that *shenme* is ungrammatical in the subject position of Mandarin X-NEG-X questions, a specific type of polar questions in Mandarin Chinese (see further footnote 14). This is shown by the examples below.

- (i) * Shenme huai mei huai (ne)?
shenme broken NEG broken Q-marker
 Intended: 'Is there anything broken or not?'
 (ii) * Ta xiang cha qingchu shenme huai mei huai.
 s/he want check clearly *shenme* broken NEG broken
 Intended: 'S/he wants to check carefully if there is anything broken or not.'

82 Acquiring Negative Polarity Items

- (10) a. Ta zuotian chi le shenmepingguo
s/he yesterday eat PERF *shenme* apple
*‘S/he ate an apple yesterday.’
‘What kind of apples did s/he eat yesterday?’
- b. Ta cengjing tou guo shenme shoushi
s/he once steal PERF *shenme* jewelry
*‘S/he has once stolen some jewellery.’
‘What kind of jewellery has s/he ever stolen?’
- c. Laoshi zhidao ta shuo le shenme hua
teacher know s/he say PERF *shenme* word
*‘The teacher knows that he said something.’
‘What does the teacher know that s/he said?’
‘The teacher knows what s/he said.’

Adopting the polarity perspective of Huang (1982) and Cheng (1994, 1995), we show in this section that *shenme* – irrespective of its (non)interrogative interpretation – is an NPI of the superweak strength, restricted to nonveridical contexts only. Compared to the previous approaches, our treatment of *shenme* as a superweak NPI affords a unified understanding of both its interrogative and non-interrogative functions. Moreover, it introduces the Mandarin quantifier into the landscape of NPIs proposed in Zwarts (1998), providing evidence for nonveridicality as a licensing property for prototypical superweak NPIs (Zwarts 1995). We start with an overview of linguistic contexts that can license *shenme* by reviewing the literature.

The reason for which *shenme* is not allowed in the subject position of Mandarin X-NEG-X questions is syntactic in nature, and therefore differs from why *shenme* may not appear in (10a) to (10c). It here concerns the scope of the Mandarin X-NEG-X operator. The reader is referred to Huang (1982, 1993) for the syntactic structure of X-NEG-X questions in Mandarin Chinese and to Li (1992) for an explanation for *shenme*'s ungrammaticality in (i) and (ii).

Linguistic context	Reference
Under the scope of a negative marker	Cheng (1994, 1995), Lin (1996, 1998)
Restrictive clauses of a universal quantifier	Cheng (1994, 1995), Lin (1996, 1998)
Conditional clauses	Cheng (1994, 1995), Lin (1996, 1998)
<i>Before</i> -clauses	Lin (1996, 1998), Xie (2007)
Donkey sentences	Cheng and Huang (1996), Li (2002)
Interrogative contexts	Li (1924), Lü (1982, 1985)
Imperfectives (futural, habitual and progressive aspects)	Li (1992), Lin (1996, 1998), Xie (2007)
Imperatives	Li (1992), Lin (1996, 1998)
Modal contexts	Li (1992), Lin (1996, 1998), Xie (2007)
Polar questions ¹⁴	Cheng (1994, 1995), Lin (1996, 1998)
Complement clauses of non-factive verbs	Lin (1998)
Under the scope of inference-marker <i>le</i>	Lin (1998)

Table 1¹⁵: Linguistic contexts sanctioning *shenme*

In Table 1 we listed a total of 12 linguistic contexts in which *shenme* is allowed to appear according to the literature. We now categorise these 12 contexts depending on their degree of negativity. Negative contexts introduced by a sentential negative marker are Anti-Morphic. Restrictive clauses of a universal quantifier, conditional clauses and *before*-clauses are typical DE-contexts. Donkey sentences in Mandarin Chinese are DE as well because the entailment relationship from (12a) to (12b) holds.

¹⁴ Polar questions here include X-NEG-X questions that are typical in Mandarin Chinese. An X-NEG-X question contains, as its name predicts, an X-NEG-X construction, which is absent in a generic polar question. In such an X-NEG-X construction, X refers to a lexical element of any morphological category, such as a noun, a verb or an adjective and NEG refers to a negative marker, i.e. *bu* or *mei*. Some examples of Mandarin X-NEG-X examples are given below.

- (i) Ni jintian wan mei wan (ne)?
 you today late NEG late Q-marker
 'Were you late today, or not?'
- (ii) Ta erzi shi bu shi hen congming (ne)?
 His/her son COP NEG COP very clever Q-marker
 'Is his/her son very clever or not?'
- (iii) Nimen zuowan shui mei shui (ne)?
 you last night sleep NEG sleep Q-marker
 'Did you sleep last night or not?'

¹⁵ Examples of *shenme* occurring in each of the linguistic context listed in Table 1 are given in Appendix I.

84 Acquiring Negative Polarity Items

- (12) a. Ni xiangyao shenme shuiguo, wo jiu gei
 you want *shenme* fruit I then for
 ni mai shenme shuiguo.
 you buy *shenme* fruit
 'Whatever fruit you would like to have, I will buy it for you.'
- b. Ni xiangyao shenme pingguo, wo jiu gei
 you want *shenme* apple I then for
 ni mai shenme pingguo.
 You buy *shenme* apple
 'What ever apple you would like to have, I will buy it for you.'

Interrogative sentences, imperfectives, imperatives and modal contexts introduced by epistemic modal adverbs are prototypical nonveridical contexts. Section 2 already illustrates that polar questions and complement clauses of non-factive verbs exhibit nonveridicality. According to Lin (1998), sentences marked by the inference marker *le* in Mandarin Chinese are nonveridical as well, since as an indicator for circumstantial inference, *le* expresses epistemic modality and "may allow a speaker to infer that something must have happened only on the basis of his/her observation of the environment without witnessing the event or changing state" (Lin 1998: 223). To summarise, all the 12 linguistic contexts listed in Table 1 exhibit at least nonveridicality.

In addition to these linguistic contexts, however, we also observe that *shenme* can appear in the following kinds of negative contexts. They are negative contexts introduced by an inherently negative verb or a negative quantifier as shown in (13a) and (13b) respectively, and those introduced by a negative universal quantifier as given in (13c). These negative contexts are all DE; the contexts illustrated in (13a) and (13b) are even Anti-Additive as well.

- (13) a. Ta founen shuo guo shenme fashehui de hua¹⁶
 he deny say PERF *shenme* antisocial MOD word
 'He denied having said any antisocial word.'
- b. Meiren shuo guo shenme fanshehui de hua.
 nobody say PERF *shenme* antisocial MOD word
 'Nobody said any antisocial word.'
- c. Bushimeigeren dou shuo le shenme.¹⁷
 not everybody all say PERF *shenme*
 'Not everybody said anything/something.'

¹⁶ This sentence can also be assigned an interrogative interpretation if uttered with a rising intonation and/or in the presence of a Q-marker *ne*: 'What is that antisocial word that he denied to have said?'

¹⁷ This sentence can also be assigned an interrogative interpretation if uttered with a rising intonation and/or in the presence of a Q-marker *ne*: 'What is that that not everybody has mentioned?'

As introduced already in Section 2, Anti-Morphic contexts, Anti-Additive but not Anti-Morphic contexts and DE-contexts are all nonveridical. This means that all the attested linguistic contexts in which *shenme* can appear are nonveridical. But is the distribution of *shenme* also restricted to nonveridical contexts? As illustrated in (10), it is infelicitous to use *shenme* in simple affirmative clauses, in perfectives or in complement clauses of a factive verb. The fact that these contexts are all veridical confirms *shenme*'s restricted distribution to nonveridical environments only.¹⁸ We therefore conclude that *shenme* is a superweak NPI that requires at least nonveridical contexts as felicitous licensing conditions.

As to provide empirical evidence for *shenme*'s status as a superweak NPI, we executed a corpus investigation by employing a subcorpus of the *PKU-CCL YuLiaoKu* (the PKU-CCL Corpora), in particular *KouYu* 'spoken Mandarin'. The corpus results are summarised in the table below, which presents a quantitative overview of how the indefinite is distributed in spoken Mandarin.

Nonveridical	Count (percentage)	Veridical	Count (percentage)
Anti-Morphic	86 (9.21%)	<i>perfectives</i>	1 (0.11%)
Anti-Additive but not Anti-Morphic	1 (0.11%)		
DE but not Anti-Additive	130 (13.92%)		
Nonveridical but not DE	716(76.66%)		
Total	933 (99.89%)	Total	1 (0.11%)

Table 2: Distribution of *shenme* in spoken Mandarin¹⁹

As can be seen from the results above, *shenme* appears in nonveridical contexts in spoken Mandarin at more than 99% of the times. This shows that Mandarin speakers do indeed analyse the indefinite as a superweak NPI, banned from veridical contexts only.

¹⁸ As already mentioned all these contexts may be assigned an interrogative interpretation if uttered with a rising intonation and/or in presence of a Q-marker *ne*; however, when an interrogative interpretation is achieved, these contexts are no longer veridical but nonveridical. Thus, the restricted distribution to nonveridical contexts only, proposed for the Mandarin indefinite is not violated.

¹⁹ More than 2000 utterances containing *shenme* were attested in the subcorpus *KouYu*; we randomly selected and analysed 1000 of these for practical reasons. Out of these 1000 utterances, 66 contained *wei shenme* 'for a reason', which partially overlaps with the target morphologically, but is syntactically and semantically different. The total number of utterances included in Table 2 is therefore 934.

4 Explaining *shenme* as a superweak NPI

From a distributional perspective, we showed in Section 3 that *shenme* is an NPI that is licensed by all nonveridical contexts. This section provides an explanation for why *shenme* is a superweak NPI, surviving in nonveridical contexts only (cf. Zwarts 1998).

We here adopt Giannakidou (2002): NPIs that are subject to nonveridical licensing may become NPIs because they are referentially deficient. Before we show how this analysis explains *shenme*'s restricted distribution to nonveridical contexts only, we briefly demonstrate referentiality and semantic contexts that require obligatory referring and those that do not.

Referentiality can be informally understood as the ability to refer. Most NPs, for instance, exhibit this ability and can therefore be employed to refer. In examples given in (13), indefinite NPs (marked in italics) *a book*, *a car* and *a tree* refer to an entity in the world that meets the description of these indefinite NPs given by the context, i.e. on a round table that the speaker is looking for, with four cylinders that John is searching for, and in the Vondelpark that the parents of the speaking are looking for, respectively.

- (13) a. I am looking for *a book* on a round table.
 b. John is searching for *a car* with four cylinders.
 c. My parents are looking for *a tree* in the Vondelpark.

In none of the examples above does the indefinite NP refer obligatorily, as it might be the case that no entity existed such that it was a book or a car or a tree, meeting the description given by the context. However, referring is obligatory when the same NPs appear in the following sentences.

- (14) a. I read *a book* yesterday.
 b. John bought *a car* last year.
 c. My parents planted *a tree* in 2010.

Utterances (14a) to (14b) necessarily presuppose the existence of at least one entity that meets its contextual description, i.e. read by the speaker yesterday, bought by John last year and planted by the parents of the speaker in 2010. Therefore, the indefinite NPs' *a book*, *a car* and *a tree* must obligatorily refer. The examples given in (14) are all veridical expressions. In other kinds of veridical contexts, such as in perfectives (see (15a)), complement clauses of a factive verb (see (15b)), NPs must also refer.

- (15) a. I have read *a book* since the last time I visited my parents.
 b. I know that John bought *a car* last year.

On the contrary, the obligation to refer disappears when NPs appear in the following contexts: under the scope of negation in (16a) and (16b), in

conditional clauses in (16c), in complement clauses of a non-factive verb in (16d) and scoped over by a modal adverb in (16e).

- (16) a. I did not read *a book* yesterday.
 b. Nobody read *a book* yesterday.
 c. If John bought *a car* last year then he does not have to do it this year.
 d. I guess that John bought *a car* last year.
 e. Perhaps my parents planted *a tree* in 2010.

The contexts illustrated above are all examples of nonveridical contexts. As introduced in Section 2, nonveridical contexts are contexts that cannot entail the truth of an embedded proposition. This is why NPs uttered in such conditions do not necessarily presuppose the existence of a certain entity that meets the description provided by the context, as such explaining why nonveridical contexts do not require obligatory referring.

Given the generalisation that veridical contexts involve obligatory reference whereas nonveridical contexts do not, the conclusion is that only indefinites that are able to refer may survive in contexts that presuppose existential import. Consequently, indefinites and/or quantifiers that are not able to refer cannot survive in contexts that presuppose existential import and may therefore appear in nonveridical contexts (Giannakidou 2002). On the basis of the distribution of the Mandarin indefinite restricted to nonveridical contexts only, we analyse *shenme* as an existential quantifier that lacks referentiality in its lexical semantics (see Li 1992 and Lin 1998 for a similar but not identical approach). Hence, it is *shenme*'s referential deficiency that restricts this indefinite to nonveridical contexts only that do not force it to refer only, explaining why *shenme* is a superweak NPI.

5 Acquiring *shenme* as a superweak NPI

Our analysis that *shenme* is a superweak NPI due to its referential deficiency explains why Mandarin speakers only use this indefinite in nonveridical contexts; but it also raises a learnability problem. *Shenme*'s absence in veridical contexts such as those shown in (10) does not necessarily indicate its referential deficiency in the target grammar. It then appears that children would not be able to acquire that *shenme* can only appear in nonveridical contexts. We would thus expect children to overuse *shenme* in veridical contexts. However, without being confronted with any negative evidence, i.e. information about what is impossible and ungrammatical in a target grammar (Pinker 1995, among others),²⁰ it is

²⁰ For a discussion on the absence of negative evidence, the reader is referred to Baker and MacCarthy (1981), Braine (1971), Brown and Hanlon (1970), Cowie (1997), Gropen et al. (1991), Marcus (1993), Marcus et al. (1992), Pinker (1984, 1995, 2013). For a discussion on the unreliability of

88 Acquiring Negative Polarity Items

impossible for children to unlearn the overgeneralised use of the NPI. As to understand how Mandarin children can acquire *shenme*'s non-referentiality based on positive evidence only, i.e. information about what is possible and grammatical in a target language (e.g. Pinker 1995), we follow Van der Wal (1996) in hypothesizing a conservative widening learning strategy in children's acquisition of the Mandarin NPI.

According to the conservative widening learning hypothesis, the acquisitional process of the NPI is analysed as having different developmental stages. In the first stage, children are assumed to establish the strictest possible analysis of the NPI based on limited input data available at the beginning of acquisition. While confronted with more input data falsifying the strict initial analysis children are assumed to weaken down the strict analysis and establish a reanalysis of the NPI. Such a weakening-down process according to language input continues until a reanalysis is achieved that explains all input data.

In order to provide empirical evidence for this learning strategy, we executed a corpus study in the CHILDES database (MacWhinney 2009) to investigate Mandarin children's acquisition of the superweak NPI. A total of 734 CHAT files of subcorpora *Beijing 2* (Tardif 1993, 1996), *Zhou 1* and *Zhou 2* (Zhou 2004a, 2004b) were analysed, covering spontaneous speech data of more than 40 monolingual Mandarin children aged between 1 and 5 years old. The procedure of our corpus research is as follows. First we divided all children into 4 different groups depending on their age at the time of recording: Group 1 (1 to 2 years old), Group 2 (2 to 3 years old), Group 3 (3 to 4 years old) and Group 4 (4 to 5 years old). After that we collected all utterances containing the target NPI *shenme* per age group. All the utterances of *shenme* were then categorised depending on their semantic property. Raw results are presented in the table below.

Semantic contexts	Group 1	Group 2	Group 3	Group 4
Anti-Morphic	0	1	5	15
DE but not Anti-Additive	0	1	1	1
Interrogative sentences	0	53	170	335
Other nonveridical but not DE	0	0	0	30
Unclear	0	0	1	0
Total	0	55	177	381

Table 3: Distribution of *shenme* in child Mandarin

Looking at how the target NPI was distributed, we only found a significant difference between children older than the age of 4 and those below 4 years old ($p=.000$, $df=6$). This result is presented in the graph below. Moreover, we

negative evidence, the reader is referred to Marcus (1993). For the fact that language learners do not seem to benefit from negative evidence if there is any, we refer the reader to MacWhinney et al. (2002), McNeill (1966), Stromswold (1994), among others.

found that the contributor to this significant effect is the emergence of nonveridical contexts that are neither interrogative nor DE, forming a new type of licensing contexts for the target NPI. This means that whereas Mandarin children below the age of 4 are only able to use the target NPI in interrogative sentences (more than 99% of the times), their older counterparts are also capable of employing other kinds of nonveridical contexts that are not DE to license *shenme* (at approximately 8% of the times).

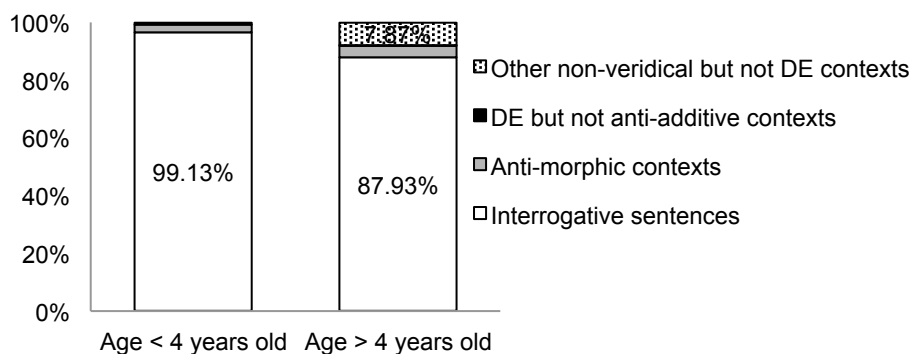


Figure 1: Distribution of *shenme* in early and late child Mandarin

We take the developmental pattern illustrated above to represent an analysing and a reanalysing process of Mandarin children in the acquisition of the NPI. Since we do not assume any inborn linguistic knowledge of *shenme* being lexically non-referential, we started by looking at language input in order to understand Mandarin children's initial step to acquire the target NPI. In child-directed Mandarin in the investigated subcorpora of CHILDES, we found that *shenme* appears in an interrogative sentence at a frequency of more than 97%. Given *shenme*'s overwhelming occurrences under the scope of an interrogative operator in the input, we hypothesise that Mandarin children start out with a narrow assumption of the target NPI being a *wh*-quantifier. However, this initial analysis by Mandarin children can be falsified by input evidence showing *shenme* in a non-interrogative sentence. In child-directed Mandarin, we observed that at approximately 3% of the times the NPI is used in a nonveridical context that is not interrogative. *Shenme*'s appearance in such nonveridical contexts is sufficiently infrequent. Nevertheless, it still poses a problem for children's strong analysis of *shenme* as a *wh*-quantifier, due to its inability to explain why *shenme* is also allowed to appear in non-interrogative nonveridical contexts. In order to explain this, children need to establish a less narrow reanalysis that is compatible with all input data. Given the fact that only non-referential existential quantifiers are subject to a restricted distribution of nonveridical contexts only, including both interrogative and non-interrogative sentences (cf. Giannakidou 2002), we hypothesise that *shenme* is reanalysed as exactly that; a non-referential existential quantifier that cannot give rise to

90 Acquiring Negative Polarity Items

any existential import (after Lin 1998), similar to *wh*-quantifiers, but is allowed to appear in non-interrogative nonveridical contexts as well. Based on the significant difference observed between the Mandarin children below the age of 4 and their older counterparts (Figure 1), we further hypothesise that the reanalysis of *shenme* – being referentially deficient – is established shortly after the age of 4.

The analysis and the reanalysis sketched above explain the developmental pattern attested in this corpus research. The fact that *shenme* only appears in interrogative sentences in early child Mandarin is understood by children's strict assumption of this indefinite as a *wh*-quantifier, at ages younger than 4: the analysis. The broader distribution of *shenme* in a variety of nonveridical contexts including interrogative sentences in late child Mandarin is accounted for by the weaker reanalysis of *shenme* being referentially deficient after the age of 4: the reanalysis. Moreover, the analysing and the reanalysing processes provide evidence for the conservative widening learning strategy in Mandarin children's acquisition of the superweak NPI. First, in both the analysing and the reanalysing process, Mandarin children make use of positive evidence only. Second, the acquisitional pathway of *shenme* exhibits a clear widening development, as the NPI is distributed in a broader set of contexts in late child Mandarin than earlier stages. Finally, Mandarin children – regardless of their age – do not overuse *shenme* in veridical contexts since we did not attest any overgeneralisation errors of the NPI. We therefore conclude that Mandarin children acquire *shenme* as a non-referential superweak NPI via the conservative widening learning strategy.

6 Summary

In his 1995-paper, Zwarts proposed that nonveridicality is the logico-semantic property that licenses the weakest type of NPIs. Although the existing body of literature has hardly reported any polarity items that are systematically licensed in all nonveridical contexts, the current paper presents a prototypical superweak NPI that indeed exhibits such a distribution, providing crucial empirical evidence for Zwarts' proposal of almost twenty years ago.

We start by introducing NPIs and nonveridical environments. By examining the distribution of the Mandarin indefinite *shenme* in the Chinese literature, we conclude that *shenme* is a superweak NPI, allowed to appear in nonveridical contexts only. Our data collected in the PKU-CCL Corpora confirm this as well, since virtually all contexts containing the target NPI were nonveridical. We then present an explanation for why *shenme* has become an NPI of the weakest type, systematically banned from veridical contexts only. Following Giannakidou (2002), *shenme* is analysed as a lexically deficient indefinite that cannot refer on its own and therefore may only appear in nonveridical contexts that do not presuppose any existential

import. The acquisition of the Mandarin NPI is examined by means of an intensive search in the CHILDES database. The child data show that the acquisition of *shenme* exhibits an analysing and a reanalysing process. After an initial narrow assumption of *shenme* being a *wh*-quantifier, which is a specific type of non-referential quantifier, Mandarin children reanalyse the target NPI more generally as an existential quantifier that lacks referentiality.

Our treatment of the Mandarin indefinite that states that it lacks referentiality explains why *shenme* is a superweak NPI restricted to nonveridical contexts only. However, it raises several further questions as well. The first question concerns a series of quantifiers in Mandarin Chinese that are analysed as *wh*-terms according to traditional Chinese grammar: *shei* 'a person', *weishenme* 'for a reason', *nali* 'a place', etc. Similar to *shenme*, these so-called *wh*-terms can also appear in non-interrogative but still nonveridical contexts (Huang 1982; Lin 2011a). If the distribution of all these quantifiers is indeed also restricted to nonveridical contexts, we can generalise our NPI-analysis of *shenme* to these quantifiers by adopting Zwarts' notion of nonveridicality. Moreover, the acquisition of this series of superweak NPIs in Mandarin Chinese will also be driven by the notion of nonveridicality – assuming a similar distributional pattern as that of *shenme* in the language input.

Secondly, our proposal motivates a typological investigation of NPIs of the weakest type. Mandarin Chinese is a *wh*-in-situ language; interrogative sentences are therefore not syntactically marked by *wh*-movement as in Dutch or English, for instance. Ni (2005) and Zhou (2010), among others, list several criteria to distinguish an interrogative sentence from its non-interrogative counterparts in Mandarin Chinese. Apart from two prosodic requirements,²¹ an important grammatical property of interrogative sentences in Mandarin Chinese is the presence of an overt Q-marker in the sentence-final position. However, as Ni (2005) points out, this Q-marker may also be covertly present. This leads to two possible resolutions of a sentence containing *shenme* but without an overt Q-marker. Speakers either assign this sentence as interrogative by assuming a covertly present Q-marker; or they assign this sentence as non-interrogative by their analysis of *shenme* as a superweak NPI. Since Chinese is presumably not unique in this sense we may expect other *wh*-in-situ languages that do not require an overtly present Q-marker to exhibit superweak NPIs for the same reason of non-referentiality, similar to *shenme*; but we leave this for further exploration.

A third topic for further exploration is related to the current methodology. We executed a corpus study. But because corpus research restricts our observation to children's production only, which does not necessarily indicate what children can or will produce, another approach of interest for further research is to confirm the widening learning pathway attested here in an experimental setting. By manipulating *shenme*'s

²¹ The two prosodic requirements for interrogative sentences in Mandarin Chinese are a rising intonation at sentence level and a main sentential stress on a *wh*-quantifier in a traditional sense.

92 Acquiring Negative Polarity Items

appearance in different types of nonveridical contexts, e.g. interrogative sentences, under the scope of negation, modal contexts, we executed a sentence repetition task with monolingual children aged between approximately 3 and 5 years old (Lin Under review). Preliminary results appear to confirm our corpus findings that the acquisition of this Mandarin NPI exhibits an initial interrogative assumption. A detailed description of our data and a discussion of our experimental results are part of our further research.

Chapter V: Distributionally constrained items in child language: acquisition of the superweak NPI *shenme* 'a/some' in Mandarin Chinese*

Abstract

This paper presents new experimental results obtained from 88 Mandarin children (age range: 2;11–4;09; M=3;11; SD=6 months; 44 girls) in their acquisition of *shenme* 'a/some', a proto-typical superweak Negative Polarity Item (NPI) that survives in nonveridical contexts only (cf. Lin et al. 2014). The existence of NPIs like *shenme* leads to a learnability problem. Without being confronted with negative evidence, such as corrective feedback or explicit instructions on *shenme*'s ungrammaticality in contexts that are not nonveridical, how can children detect *shenme*'s distributional constraint based on positive evidence only? By analysing children's performance in an elicited imitation task, this paper investigates the learnability of the superweak NPI in Mandarin Chinese. The results suggest that the acquisition of the NPI has two phases, representing an early and a late child grammar of *shenme*, respectively. Whereas the early grammar consists of a concrete *wh*-analysis of *shenme*, the late grammar rather contains one abstract NPI-analysis. This shows that children are able to detect NPIs' distributional constraint even in the absence of negative evidence: they start out with a strict assumption but switch to a less strict analysis later on.

1 Introduction

Natural languages exhibit words or expressions that cannot freely occur in all kinds of configurations. For instance, English temporal adverb *yet* can only appear in negative contexts, such as in the scope of a sentential negation or a negative indefinite as shown in (1a) and (1b), but is not allowed in simple affirmative contexts as demonstrated in (1c).

- (1) a. Max has not finished yet.
b. Nobody has finished yet.
c.* Mary has finished yet.

Words or expressions that show a constrained distribution in negative contexts only as illustrated above for *yet* are called *Negative Polarity Items*

* This chapter is adapted from Lin, Jing. (Under review). Distributionally constrained items in child language: acquisition of the superweak NPI *shenme* 'a/some' in Mandarin Chinese.

94 Acquiring Negative Polarity Items

(NPIs) (cf. Ladusaw 1979). Other well-studied examples of NPIs involve English *any*-terms. As shown in (2), *any*-terms can survive in a wide range of negative contexts that are categorised as *Downward Entailing* (DE) in the literature on polarity licensing (Fauconnier 1975, 1978, 1980; Ladusaw 1979), including contexts introduced by a sentential negation, a negative indefinite or a semi-negative expression like *few*, the restriction of a universal quantifier, conditional clauses, etc.¹ However, contexts that do not exhibit DEness, such as the simple past tense or in the scope of a subjunctive modal adverb, do not sanction *any*-terms, as shown in (3).

- (2) a. Max did not kiss anybody yesterday.
b. Nobody bought anything for Max's birthday.
c. Few students have read any papers for the lecture today.
d. Every parent that prepared anything for the party can park free of charge.
e. If Mary has seen any robins yesterday, she would tell Max.
- (3) a.* Max saw any girls yesterday.
b.* Mary has probably brought anything for Max's birthday.

NPIs form a cross-linguistic phenomenon (see Haspelmath 1997 for a non-exhaustive overview) and are attested in Mandarin Chinese as well. An example is *shenme* 'a/some'. As observed for all NPIs, *shenme* exhibits a limited distribution in certain negative environments only (e.g. Cheng 1994; Huang 1982; Li 1992; Lin 1996, 1998). Recently, Lin et al. (2014) have demonstrated that this NPI is in fact attested in the whole array of *nonveridical* contexts, a superset of the set of DE-contexts. Informally speaking, nonveridical contexts are contexts that do not entail the truth of an embedded proposition, such as conditional clauses, questions (*wh*- or polar), subjunctive modal contexts, and imperfectives. Given its broad distribution in all kinds of nonveridical contexts, Lin et al. (2014), following Zwarts' typology of NPIs in terms of strengths (1981, 1986, 1995), categorise Mandarin *shenme* as a proto-typical *superweak* NPI, restricted by nonveridicality only.

The existence of NPIs such as the superweak NPI *shenme* in Mandarin gives rise to a learnability challenge for language-acquiring children. In the absence of negative evidence, such as corrective feedback or explicit instructions on its ungrammaticality in contexts that are not nonveridical, how are Mandarin children able to detect *shenme*'s distributional constraint based on positive evidence only?

¹ Downward Entailing contexts are defined based on their logico-semantic behaviour. For every arbitrary X, Y : if $f(XUY) \rightarrow f(X)$ and/or $f(XUY) \rightarrow f(Y)$, then the function f is Downward Entailing. This definition is adapted from Van der Wouden (1997). Informally speaking, Downward Entailing contexts are those contexts in which the entailment relation goes from set to subset (see also Fauconnier 1975, 1978, 1980).

Nonetheless, the acquisition of NPIs has attracted little attention in the literature so far – let alone that of the superweak NPI *shenme* in Mandarin Chinese. In fact, research on the learnability of NPIs is merely restricted to English *any* (Tieu 2010, 2013, 2015; Tieu and Lidz Under review), Dutch *hoeven* ‘need’ (Lin et al. 2015; Koster and Van der Wal 1996; Van der Wal 1996), and Dutch *meer* ‘more’ (Van der Wal 1996). This paper therefore explores the learnability of the superweak NPI *shenme* by means of an experiment with an elicited imitation task. By investigating Mandarin children’s acquisition of the NPI, this paper also aims to provide some insight into how language learners acquire distributionally constrained items in general.

Data obtained from 88 monolingual Mandarin children in the elicited imitation task (age range: from 2;11 to 4;09; M=3;11; SD=6 months; 44 girls) lead to the following developmental patterns. First, as early as the age of 2;11, Mandarin children have already acquired *shenme*’s appearance as a *wh*-word in *wh*-questions. Second, some, but crucially not all, children have also acquired that *shenme* is allowed to appear in the scope of a sentential negation as early as 2;11. When growing older, children are developing a grammar of *shenme* that allows it in a wider range of nonveridical contexts than merely in *wh*-questions. Last but not least, children – regardless of ages – are indeed aware of *shenme*’s distributional constraint that it cannot survive in veridical contexts, such as in the perfect tense.

These developmental patterns suggest that the acquisition of the superweak NPI exhibits two phases, which are interpreted to represent two distinct grammars of *shenme* during the acquisition: an early and a late grammar. Whereas the early grammar turns out to consist of a *wh*-analysis (arguably with an additional knowledge component underlying *shenme*’s occurrence in the scope of a sentential negation, which is available to some language learners only), the late grammar merely contains an abstract NPI analysis that gives rise to *shenme*’s occurrence in the whole array of nonveridical contexts – including *wh*-questions. This paper discusses possible factors that may underlie the attested learning path, such as language input, and the development of children’s vocabulary of nonveridicality. Based on the results and the discussion, this paper will conclude that even in the absence of negative evidence, children are able to detect NPIs’ restricted distribution. Their strategy is to start out with a strict assumption and weaken it to a less strict analysis later on (cf. Manzini and Wexler 1987; Snyder 2008; see also Van der Wal 1996).

The organisation of the paper is as follows. Section 2 briefly demonstrates the restricted distribution of Mandarin *shenme* to nonveridical contexts and its learnability problem. Section 3 introduces the current experiment, including method, design, participants and scoring. Results of the experiment are presented in Section 4, and the different developmental patterns attested during the acquisition of the superweak NPI in Mandarin Chinese are illustrated as well. Discussion of the factors that may underlie the attested learning patterns follows in Section 5; and Section 6 concludes the paper.

2 *Shenme* as a superweak NPI and its learnability problem

Shenme is traditionally viewed as a *wh*-word similar to English *what* (see (4)), which also allows non-interrogative, existential interpretations comparable with English *a(n)* or *some* when appearing in certain non-*wh* contexts. Examples of such contexts are in the scope of a sentential negation, conditional clauses, subjunctive configurations introduced by epistemic modal adverbs, polar questions, etc. (see (5a) to (5e) respectively) (Cheng 1994; Huang 1982; Li 1992; Lin 1996, 1998; among many others).

- (4) Mali zuotian mai-le shenme shu ne?
 Mary yesterday buy-PERF *shenme* book Q-marker
 'What kind of books has Mary bought yesterday?'
- (5) a. Mali zuotian mei mai shenmeshu.
 Mary yesterday not buy *shenme*book
 'Mary did not buy (a) book(s) yesterday.'
- b. Ruguo Mali zuotian mai-le shenme shu
 if Mary yesterday buy-PERF *shenme* book
 ta yiding huigaosuwo.
 she definitely will tell I
 'If Mary bought a book yesterday she will definitely let me know.'
- c. Mali zuotian haoxiang mai-le shenme shu.
 Mary yesterday probably buy-PERF *shenme* book
 'Mary has probably bought a book yesterday.'
- d. Makesi zuotian gei Mali mai-le shenme shu me?
 Max yesterday for Mary buy-PERF *shenme* book Q-marker
 'Has Max bought (a/some) book(s) for Mary yesterday?'

The Chinese literature has argued that *shenme* – when it is not assigned a question usage – exhibits NPI-like behaviour, since it is ungrammatical when appearing in simple affirmative contexts such as in the perfect tense, or in the complement clause of a factive predicate like *know* (Cheng 1994; Li 1992; Lin 1996; Xie 2007; among others). This is shown below.

- (6) a.* Makesi zuotian mai-le shenmeshu.
 Max yesterday buy-PERF *shenme*book
 Intended: 'Max has bought (a) book(s) yesterday.'
- b.* Wo zhidao Mali zuotian mai-le shenme shu.
 I know Mary yesterday buy-PERF *shenme* book
 Intended: 'I know that Mary has bought (a) book(s) yesterday.'

Recently, it has been proposed that *shenme* is an indefinite NPI surviving only in so-called *nonveridical* contexts irrespective of its *wh*- or non-*wh* usages (Lin et al. 2014; Lin and Giannakidou Submitted). Nonveridicality is defined in terms of truth (Zwarts 1995):

- (7) A propositional operator F is veridical, iff Fp entails p : $Fp \models p$;
otherwise F is nonveridical.

Informally, nonveridical contexts can be interpreted as those that do not entail the truth of an embedded proposition. The complement clause of non-factive verbs such as *guess*, for instance, is nonveridical, since the truth of the proposition (8a) is not entailed by (8b). In the same vein, polar questions and epistemic uncertainty contexts are nonveridical, since both (8c) and (8d) do not necessarily entail (8a).

- (8) a. Max kissed a girl yesterday.
b. I guess that Max kissed a girl yesterday.
c. Did Max kiss a girl yesterday?
d. Perhaps Max kissed a girl yesterday.

A *veridical* context, on the other hand, is a context in which the truth of a proposition is entailed. For instance, the complement clause of factive predicates such as *know* in (9b) is veridical, since it necessarily entails the truth of its embedded proposition (9a).

- (9) a. Max kissed a girl yesterday.
b. I know that Max kissed a girl yesterday.

Based on the definition and the informal interpretation of (non)veridicality, Lin et al. (2014) examine all the contexts that sanction *shenme*, including *wh*-questions, and show that they are all nonveridical, as none of them entails the truth of an embedded proposition. Crucially, the authors also demonstrate that the contexts that do not favour *shenme* all turn out to be veridical. According to the nonveridicality theory of polarity licensing (Giannakidou 1997, 1998, 2002, 2011; Giannakidou and Zwarts 1998; Zwarts 1995; 1998), nonveridical contexts represent even weaker negative environments than DE-contexts. In fact, nonveridical contexts are the weakest type of negative configurations in natural languages that may license NPIs (Giannakidou 1997, 1998, 2002, 2011). Given that English *any*-terms, restricted to DE-contexts, are categorised as *weak* NPIs in the typology of NPIs in terms of strengths (Zwarts 1981, 1986, 1995; see also Van der Wouden 1994),² Lin et al. (2014) conclude that *shenme* is a prototypical *superweak* NPI.

² The strength of NPIs is categorised depending on the type of negative contexts in which it can and cannot be licensed (Hoeksema 2000; Nam 1994; Van der Wouden 1997; Zwarts 1986, 1995, 1998). The nonveridicality theory of polarity licensing (cf. Giannakidou and Zwarts 1999) distinguishes four types of negative environments based on their logico-semantic behaviours: *Anti-Morphic* contexts, *Anti-Additive* contexts, *Downward Entailing* (DE) contexts and *nonveridical* contexts (see Van der Wouden 1997 for the relevant definitions and examples). This gives rise to NPIs of four different

98 Acquiring Negative Polarity Items

Although *shenme* must only appear in nonveridical contexts, it is not the only option in the language to quantify a noun phrase in such environments. Generally speaking, if *shenme* is not used as a question term, Mandarin speakers can also use a bare noun phrase *shu* ‘book’ or a plain noun phrase *yiben shu* ‘a book’ for roughly the same existential meaning, instead of using the counterpart *shenme* noun phrase *shenme shu* ‘a/some book’. This observation is supported when comparing (5) to (10). However, this does not hold in veridical contexts, such as in the perfect tense. There, bare noun phrases or plain noun phrases are the only possibilities, since the NPI *shenme* does not survive in veridical environments. This is demonstrated in (11).

- (10) a. Mali zuotian mei mai (yi-ben) shu.
 Mary yesterday not buy one-CL book
 ‘Mary did not buy (a) book(s) yesterday.’
 b. Ruguo Mali zuotian mai-le (yi-ben) shu ta
 if Mary yesterday buy-PERF one-CL book she
 yiding hui gaosu wo.
 definitely will tell I
 ‘If Mary bought a book yesterday she will definitely let me know.’
 c. Mali zuotian haoxiang mai-le (yi-ben) shu.
 Mary yesterday probably buy-PERF one-CL book
 ‘Mary has probably bought a book yesterday.’
 d. Makesi zuotian gei Mali mai-le (yi-ben) shu me?
 Max yesterday for Mary buy-PERF one-CL book Q-marker
 ‘Has Max bought (a/some) book(s) for Mary yesterday?’
- (11) Makesi zuotian mai-le (yi-ben)/(*shenme) shu.
 Max yesterday buy-PERF one-CL/*shenme* book
 ‘Max has bought (a) book(s) for yesterday.’

The existence of NPIs such as Mandarin *shenme* leads to a learnability problem for language-acquiring children, based on the reasoning that absence of evidence is not evidence of absence (see also Lin et al. 2015; Tieu 2010; Van der Wal 1996). Examples (4) to (6) already exemplify how *shenme* is distributed in the language. Suppose now that these examples may also represent the distribution of the superweak NPI *shenme* in child-directed speech, which contributes to language input for Mandarin-acquiring

strengths: *superstrong* NPIs restricted by Anti-Morphicity; *strong* NPIs licensed by anti-additivity; weak NPIs attested in DE-contexts only; and *superweak* NPIs requiring nonveridicality as sufficient licensing property (see Nam 1994; Zwarts 1981, 1986). Recently, Lin et al. (2015) report an NPI exhibiting a strength between strong and weak NPIs, namely Dutch modal verb *hoeven* ‘need’. *Hoeven* is attested in all Anti-Additive contexts but is restricted to some but not all DE-environments. Given this in-between distribution, the authors dub such NPIs *strong/weak* NPIs.

children. Note that the ungrammaticality of *shenme* appearing in veridical contexts such as in the perfect tense (i.e. (6)) is not presented with an asterisk to language learners. Ungrammatical utterances containing *shenme* are rather absent in language input. This reasoning, however, does not hold the other way around: absence of (ungrammatical) constructions in input does not necessarily entail that such constructions are ungrammatical. The question is therefore how it is possible for Mandarin-acquiring children to draw the conclusion that *shenme* is subject to restricted distribution to nonveridical contexts, based merely on positive evidence containing utterances like (4) or (5).³

However, the learnability of the Mandarin NPI *shenme* has attracted little attention in the literature. The literature so far features only a few studies that are somewhat related to this topic. Huang (2014) and Zhou (2011) report that children are able to distinguish the interrogative usage from the non-interrogative usage of Mandarin *wh*-words such as *shenme* around the age of four. Huang and Crain (2014a) find that children do not show target-like performance when confronted with *shenme* appearing in the scope of a sentential negation until the age of eight. But these studies do not provide an answer to the learnability problem, as they focus on the different usages of *shenme* by children of different ages. The only research thus far that tackles the learnability of the Mandarin NPI *shenme* is Lin et al. (2014), in which the authors investigate the development of children's knowledge of the NPI through corpus research in the CHILDES database (MacWhinney 2009).

Lin et al.'s corpus exploration analyses spontaneous speech data of more than 40 monolingual Mandarin children aged between one and five years, taken from a total of 734 CHAT files of three subcorpora in the CHILDES database (MacWhinney 2009): *Beijing 2* (Tardif 1993, 1996), *Zhou 1* and *Zhou 2* (Zhou 2004a, 2004b). Based on the distributional patterns of *shenme* in child Mandarin development, the authors hypothesise that there are two developmental stages in the acquisition of the NPI. Children start using *shenme* as a mere question word in *wh*-questions, but after the age of four they also use *shenme* in a variety of other nonveridical contexts. More importantly, the authors do not find that Mandarin children overuse the NPI in veridical contexts. Assuming that each developmental stage represents a unique analysis of the target NPI in child language development, the authors conclude that Mandarin children start out with a *wh*-analysis of *shenme*, and reanalyse *shenme* as a superweak NPI shortly after the age of four.

Lin et al.'s CHILDES study provides a first glance into the learnability of the Mandarin NPI, but is restricted to the observation of language production only. But what children produce in their spontaneous speech does not always equal the exact range of their acquired linguistic knowledge. Given the methodological shortcomings of corpus research, it becomes

³ Due to space limitations, the reader is referred to a recent investigation of the acquisition of a Dutch NPI (Lin et al. 2015) for a detailed illustration of the learnability problem raised by NPIs in natural languages.

100 Acquiring Negative Polarity Items

questionable whether the absence of ungrammatical utterances containing overused *shenme* in child language also indicates the impossibility of *shenme* appearing in veridical contexts according to children's own analysis of the NPI. Do children already know that *shenme*'s distribution is restricted? In the same vein, the authors do not find that older children spontaneously use *shenme* in, e.g. polar questions, a nonveridical context in which the NPI is allowed to appear (i.e. (5d)). Is such absence of evidence then problematic for the proposed reanalysis of *shenme* in late child Mandarin that generates *shenme* in the whole array of nonveridical environments? This methodological shortcoming thus motivates an experimental investigation.

3 The experiment

The current experiment consisted of an elicited imitation task. A total of 88 monolingual Mandarin children aged between approximately three and five years old participated. This section briefly introduces the experimental method, the test design, the participants and, finally, how the data were categorised and scored.

3.1 Method

The current experiment opted for an elicited imitation task to investigate children's knowledge of the superweak NPI *shenme* in Mandarin. In an elicited imitation task, children are required to listen carefully to pre-recorded stimuli first, and then to repeat the stimuli as precisely as they could (Eisenbeiss 2010; Lust et al. 1996; Vinther 2002; among others). While repeating a stimulus, children are claimed to reconstruct their own mental representation of the stimulus, according to their own grammatical system established so far (Chomsky 1964; Eisenbeiss 2010; Keenan and Hawkins 1987; Panitsa 2001; Scholl and Ryan 1980).

If a stimulus sentence is grammatical according to the children's own grammar, they repeat the stimulus immediately after hearing it (Scholl and Ryan 1980); if, on the other hand, a stimulus is ungrammatical based on their grasp of the grammar of the target language, they either correct it in accordance with their own grammar, or do not give a response at all (Brown 1973; Kenney and Wolfe 1972; Panitsa 2001; Vinther 2002). In the current research, this means that participants only provide an imitation response of a stimulus if the appearance of *shenme* in the manipulated context of that stimulus is in agreement with their underlying grammar.

As an elicited imitation task requires children to repeat pre-recorded stimuli, working memory turns out to be of crucial importance in explaining their imitation performance (Eisenbeiss 2010; Fujiki and Brinton 1983; Gallimore and Tharp 1981; Hamayan et al. 1977; Lust et al. 1996; Montgomery et al. 1978; among others). Therefore, the length of stimuli needs to be controlled, in order to avoid children giving a repetition response

from memory alone, without first establishing their own mental representation of a stimulus (e.g. Montgomery et al. 1978). Stimuli have to be sufficiently long to override children's memory capacity, but short enough for comprehension, because children must be able to construct their own mental representations of the stimuli without omitting too many words.

Based on the results of two pilot studies (3;01–4;11; N=19), the length of the stimuli in terms of syllables was set at 18. This length equals circa ten lexical word units in the Mandarin stimuli, and is of a medium difficulty in imitation tasks for children under the age of six, as suggested in Montgomery et al. (1978). In order to compare the imitation performance of participants of different ages, the stimuli length was kept equal for all participants – regardless of their ages. However, under the assumption that working memory increases with age, this may mean that the length of 18 syllables is just too short to override older participants' working memory capacity, yielding better imitation performance by older participants when confronted with ungrammatical stimuli, which is unexpected from the perspective of adult language use.

3.2 Design

The experiment manipulated five kinds of nonveridical contexts as licensing conditions for *shenme*, to examine the exact range of children's knowledge of the licensing of the NPI. These contexts are (i) negative contexts introduced by a sentential negation, (ii) conditional clauses, (iii) epistemic uncertainty contexts introduced by modal adverbs such as *keneng* 'probably', (iv) polar questions, and (v) *wh*-questions. To investigate whether children are aware of *shenme*'s distributional constraint that it cannot survive in veridical contexts, the experiment also included an unlicensed test condition by placing *shenme* in the perfect tense.

Each of the above-mentioned (un)licensed test condition contained four items. This led to 24 test stimuli in total. Additionally, to neutralise the effect that every test stimulus involved the same word *shenme*, 18 fillers were added, of which four contained a word order error caused by a post-positioned restriction of the universal quantifier *dou* 'all'.⁴ An overview of the current experimental design is given in Appendix L. Examples of each test and filler condition are provided in Appendix M.

As mentioned earlier, all test and filler stimuli were controlled for the same length of 18 syllables. Crucially, all the manipulated (non-)licensing conditions are systematically and/or frequently attested in spontaneous

⁴ Mandarin *dou* 'all' is a universal quantifier that quantifies over a phrase or a clause that precedes it (Cheng 1995; Chiu 1990; Lee 1986; Lin 1998; Pan 2006; Wu 1999). This means that the restriction of this universal precedes rather than follows it, different from other universal quantifiers in Mandarin, like *meige* 'every', or their English or Dutch counterparts. Thus, a post-positioned restriction of *dou* gives rise to a violation of word order.

102 Acquiring Negative Polarity Items

speech data of Mandarin three-year-olds.⁵ This suggests that children as young as three years old have already acquired the lexical knowledge of different (non)veridical operators or contexts in Mandarin Chinese. This will exclude a vocabulary-based explanation in the case of poor imitation performance by younger participants.

To keep participants concentrated and interested in the experiment, visual support was employed by presenting them with a picture of familiar cartoon figures on a laptop screen before each stimulus. All stimuli were developed after selecting or designing the pictures, with the hope of ensuring that each picture conveyed as much of the corresponding stimulus as possible. The experiment lasted an average of fifteen minutes per participant.

3.3 Participants

A total of 88 monolingual children participated in the current experiment (age range: from 2;11 to 4;09; M=3;11; SD=6 months; 44 girls). They were recruited via two kindergartens in the Liaoning province, which is a Mandarin area in China. The experiment was conducted individually and took place in a quiet (class)room in the kindergartens. Two experimenters were present during the experiment. One experimenter first invited the child from a class for a game. She then introduced the four figures in the experiment, and explained how the game would proceed and what the child was expected to do. Each child was presented with four trials to get familiar with both the experimenter and the experiment. When the child proved to be able to understand what was expected of it after the trials, the experiment started. The other experimenter recorded the responses and filled in answer sheets.

3.4 Data categorisation and scoring

Responses to the stimuli were divided into two categories: *imitation* and *non-imitation*. In principle, imitation responses refer to instances in which participants repeated the manipulated stimuli. However, since the length of the stimuli was designed so that participants needed to first establish their own mental representations of the stimuli, it was hardly ever the case that they were able to repeat every word unit in a stimulus. Therefore, imitation responses were defined in the current experiment as participants repeating at least an employed noun phrase with *shenme* (e.g. *shenme dangao* 'a cake' or *shenme wanju* 'a toy') in a manipulated licensing condition (e.g. in polar questions).

⁵ The spontaneous child speech data were collected in three Mandarin subcorpora in the CHILDES database (MacWhinney 2009): *Beijing 2* (Tardif 1993, 1996), *Zhou 1* and *Zhou 2* (Zhou 2004a, 2004b). The relevant data are presented in Appendix K. Since Mandarin Chinese does not employ past participles to express perfect tense, the perfective aspect markers *le* and *dao* (cf. Sybesma 1995, 1997) were employed as a cue for the acquisition of perfect tense in the child language.

According to these criteria, both (12b) and (12c) were categorised as instances of imitation of the stimulus (12a). Although both (12b) and (12c) did not contain all word units employed in the stimulus, both responses do contain the manipulated *shenme* noun phrase (namely *shenme gushi shu* ‘a storybook’) in the manipulated licensing condition, which is an epistemic uncertainty context, introduced by the modal adverb *keneng* ‘probably’.

- (12) a. Tiaotiaohu he Weinixiong keneng zhengzai kan
 Tiger with Winnie the Pooh probably PROG read
shenme gushi shu.
 shenme story book
 ‘Tiger and Winnie the Pooh are probably reading a storybook.’
- b. Tiaotiaohu keneng zai kan shenme gushi shu.
 Tiger probably PROG read *shenme* story book
 ‘Tiger is probably reading a storybook.’
- c. Tiaotiaohu Weinixiong keneng kan shenme gushi shu.
 Tiger Winnie the Pooh probably read *shenme* story book
 ‘Tiger, Winnie the Pooh probably read a storybook.’

Other responses were regarded as *non-imitation*, including instances in which participants did not give a response at all, or provided an irrelevant response such as *Mei ting jian* ‘(I’ve) not heard (the stimulus)’ or *Bu zhidao* ‘(I’ve) no idea’, or replaced the manipulated *shenme* noun phrase by its bare or plain counterpart. Each imitation and non-imitation response was assigned a value of 1 or 0, respectively.

4 Results

In order to assess children’s knowledge of *shenme* appearing in different kinds of (non)veridical contexts at different ages, a mixed-effect logistic regression analysis was performed in R for each of the six manipulated test conditions, based on the raw imitation scores. In these logistic regression analyses, the ages of the participants (in terms of age in months) was modelled as a fixed factor, and individual participants and test items were designed as two random factors. These three factors were combined to predict the participants’ imitation scores in the current experiment. Such a regression design, conducted on the cross-sectional data, enabled one to generalise the developmental patterns of children’s knowledge of the NPI *shenme* in different (non)veridical contexts.

Results of the regression analyses are presented in the graph below. The x-axis represents the ages of participants in terms of months, whereas the y-axis indicates the imitation probability predicted by the regression models, namely how often participants are predicted to give an imitation response of a stimulus. The interpolation lines demonstrate the mean values of the predicted probabilities depending on the age.

104 Acquiring Negative Polarity Items

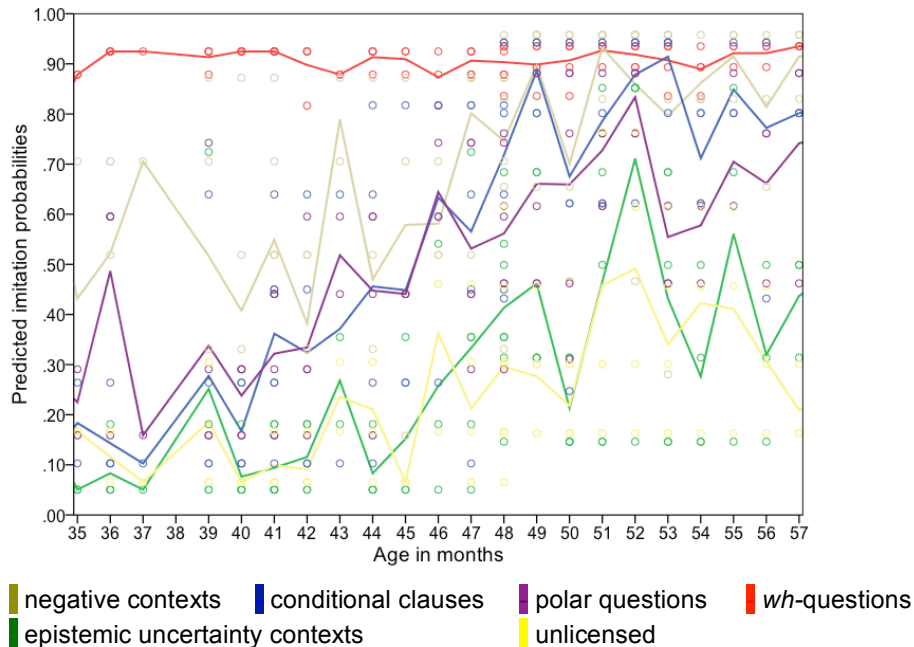


Figure 1: Development of children's imitation probabilities for each test condition

An increase in children's imitation probabilities indicates a development in their imitation performance. Given that children are only able to repeat a stimulus if it is in line with their own grammatical system, a development in children's imitation performance is interpreted as indicating a development in children's knowledge of the NPI *shenme* appearing in different semantic contexts. Bearing this in mind, the regression results presented in Figure 1 turn out to suggest three developmental patterns in Mandarin children's acquisition of the superweak NPI *shenme*.

One pattern concerns the test condition of *wh*-questions, in which the regression model does not predict any significant increase in children's imitation performance ($F(21, 66)=.954, p=.528$). Specifically, the imitation probability predicted by the regression model for this condition is an average of 0.91 (SD=0.03) throughout the whole investigated age range, namely from 2;11 to 4;09 (i.e. from 35 to 57 months).

Another developmental pattern covers the test conditions of negative contexts, conditional clauses and polar questions, for which the regression analyses predict a significant increase in how often children are able to give a repetition response to a stimulus as they grow older ($F(21, 66)=2.661, p=.001$; $F(21, 66)=6.083, p=.000$; $F(21, 66)=4.242, p=.000$; respectively). Moreover, for all these three test conditions, the regression models predict an imitation probability of at least 0.74 on average at the age of 57 months.

Finally, the test condition of epistemic uncertainty contexts and that containing ungrammatical stimuli in which *shenme* is manipulated in unlicensed, veridical contexts show a similar pattern. Although the regression analyses predict a significant increase in children's imitation probabilities in these two test conditions ($F(21, 66)=2.265, p=.000$) and $F(21, 66)=2.908, p=.001$, respectively), the models predict an average imitation probability of merely 0.44 (SD=0.11) in the test condition of epistemic uncertainty contexts, and even lower, namely 0.21 (SD =0.08), in the unlicensed test condition, at 4;09 (i.e. 57 months).

The remainder of this section presents these patterns in more detail. The three patterns described above are interpreted in 4.1 to 4.3, respectively. A summary of the experimental results follows in 4.4.

4.1 Development in the test condition of *wh*-questions

The test condition of *wh*-questions is the only condition manipulated in the current experiment that does not exhibit a significant increase in children's imitation performance. As can be seen clearly in Figure 1, the imitation probability is already predicted to be around 0.90 for children of early ages. In fact, the regression model predicts an average imitation probability of 0.91 (SD=0.03) throughout the whole investigated age range, from 35 to 57 months. Assuming that children's imitation performance in an elicited imitation task represents their underlying knowledge of the phenomenon under investigation (cf. Section 3), the high ratio of imitation in the test condition of *wh*-questions provides strong evidence that Mandarin children have already acquired the knowledge that *shenme* can appear in *wh*-interrogatives before the age of three.

4.2 Development in the test conditions of negative contexts, conditional clauses and polar questions

Another developmental pattern that arises from the regression results concerns the test conditions of negative contexts, conditional clauses and polar questions. In these three test conditions, the regression models all predict a significant increase in how often children give an imitation response to the relevant stimuli as they grow older. Moreover, the regression analyses also predict that when children are at the age of 4;09 (i.e. 57 months) (N=3) they are able to repeat the stimuli in the above-mentioned test conditions at least 74% of the time (i.e. M=0.92, SD=0.07 for negative stimuli; M=0.80, SD=0.00 for conditional stimuli; M=0.74, SD=0.24 for polar question stimuli).

The developmental pattern described here strongly suggests that Mandarin children – at least those within the investigated age range of the current experiment – are acquiring the knowledge that *shenme* is allowed to appear in a variety of nonveridical contexts outside *wh*-interrogatives: in the scope of a sentential negation, in conditional clauses and in polar questions. More importantly, this pattern provides evidence that Mandarin children have already acquired the knowledge underlying *shenme*'s occurrence in the three types of non-*wh* nonveridical contexts at the age of 4;09 (i.e. 57 months).

106 Acquiring Negative Polarity Items

However, when focusing on the starting value of children's imitation probabilities, as predicted by the regression models for the three test conditions under discussion, there turns out to be an essential difference. Whereas both the test conditions for conditional clauses and polar questions exhibit an average value of children's imitation probabilities of 0.18 (SD=0.11) and 0.22 (SD=0.09), respectively, at the age of 2;11 (i.e. 35 months), children at that early age (N=2) are predicted to be able to repeat the stimuli in which *shenme* appears in the scope of a sentential negation as often as 43% of the time on average (SD=0.38).

The poor imitation performance of younger children in the test conditions of conditional clauses and polar questions hardly signifies any effects of underlying linguistic knowledge, but rather reflects some memory effect. On the other hand, children's average imitation probability of 0.43 at the age of 35 months in the negative condition does not merely represent some working memory effect, but also suggests the acquisition of some knowledge underlying *shenme*'s appearance in the scope of a sentential negation.

However, the early knowledge underlying *shenme*'s appearance in negative contexts is not the same kind of knowledge as that underlying its occurrence in *wh*-interrogatives in (early) child language. Otherwise, why would younger children, say those below the age of 3;09 (i.e. 45 months), be able to repeat the *wh*-stimuli at least 91% of the time (SD=0.03), but negative stimuli only around 50% of the time (SD=0.26)? This difference will be addressed in the next section. By analysing the raw imitation data of the younger participants, this paper will show that the knowledge underlying *shenme*'s occurrence as an NPI in the scope of a sentential negation is acquired by some, but crucially not all younger children.

4.3 Development in the test condition of epistemic uncertainty contexts and the unlicensed test conditions

Finally, let's look at the regression results obtained for the test condition of epistemic uncertainty contexts, and the ungrammatical licensing condition in which the NPI *shenme* is placed in the perfect tense, a kind of veridical environment. From the perspective of adult speakers, *shenme*'s appearance in epistemic uncertainty contexts introduced by epistemic modal adverbs such as *haoxiang* 'probably' is fine, whereas its occurrence in veridical contexts like the perfect tense is judged ungrammatical. However, such a difference in perceived (un)grammaticality is not evident when zooming in at children's imitation performance for the relevant test conditions. Both conditions exhibit a similar developmental pattern, in which the predicted imitation probabilities increase from around 0.10 at early ages to roughly 0.40 later on. Nevertheless, due to the difference in *shenme*'s (un)grammaticality in these two manipulated test conditions, children's imitation performance as observed here is interpreted differently.

The attested development of imitation performance for the test condition of epistemic uncertainty contexts suggests that Mandarin children have not acquired the knowledge that *shenme* can appear in epistemic

uncertainty contexts even at the age of 4;09 (i.e. 57 months). This is because older Mandarin children, say the four-year-olds (i.e. from 48 to 57 months in the current experiment), are predicted to be able to repeat stimuli containing *shenme* in the scope of an epistemic modal adverb only 43% of the time on average (SD=0.25) – even though this ratio is significantly higher than what is predicted for younger participants in the same test condition. Among all the manipulated grammatical test conditions, the condition of epistemic uncertainty contexts exhibits the lowest mean imitation probability for the four-year-olds (N=45): M=0.91, SD=0.03 for *wh*-question stimuli; M=0.83, SD=0.18 for negative stimuli; M=0.80, SD=0.16 for conditional stimuli; M=0.66, SD=0.17 for polar question stimuli.

Such a comparison immediately gives rise to the question as to why there is a delay in Mandarin children's acquisition of the knowledge underlying *shenme*'s occurrence in epistemic uncertainty contexts. This question will be addressed in the next section by analysing older children's production data, illustrating how they reconstruct the relevant stimuli. The analysis of the production data will provide a methodological explanation for the delay, which is based on some divergence between the manipulated stimuli and corresponding visual support in terms of epistemic (un)certainty.

Turning to the ungrammatical constructions containing the superweak NPI in the perfect tense, the significant increase in children's imitation performance initially appears to lead to the conclusion that Mandarin children are unable to detect *shenme*'s distributional constraints: they seem to develop a grammar that is deviant from the adult grammar in the sense that it overgeneralises *shenme* in non-licensing environments. However, as the next section will show, this development, predicted by the regression model, is in fact explained by better working memory capacity of older participants compared to their younger counterparts. This means that Mandarin children are not actually developing an overgeneralising grammar, but only appear to be doing so due to the increase in working memory as they grow older.

4.4 Summary

Summarising the three developmental patterns that are generalised based on the regression results, the acquisition of the superweak NPI *shenme* in Mandarin Chinese turns out to have two phases. Assuming that each phase corresponds with a particular grammar of the NPI, the two-phase acquisitional pathway can be described as follows.

Mandarin children start out with a grammar that generates *shenme*'s appearance in *wh*-interrogatives, as well as its occurrence in the scope of a sentential negation. However, there is a difference. Whereas this early child grammar almost always acknowledges *shenme* to appear in *wh*-questions, it only sometimes allows it to appear in negative contexts.

Later on, Mandarin children develop a more tolerant grammar that systematically generates *shenme*'s appearance in a wider range of contexts than merely *wh*-questions, as they show significantly better imitation performance in all of the four manipulated non-*wh*, nonveridical conditions

108 Acquiring Negative Polarity Items

when they grow older. Nonetheless, the tolerant grammar of the NPI *shenme* in late child language does not appear to allow epistemic uncertainty contexts as its licensing environment as much as the other three non-*wh* nonveridical contexts. Strikingly, the late child grammar also seems to allow non-target-like usage of *shenme* in veridical environments.

The two-phase acquisitional pathway sketched above gives rise to further questions. What knowledge, exactly, do the early and the late child grammar consist of? And where does that knowledge come from? Are children indeed developing an analysis of the NPI that is deviant from the adult grammar, which disallows *shenme* to appear in epistemic uncertainty contexts, but tolerates it in veridical environments? These questions are left for the next section, in which different factors are taken into consideration in order to understand the attested developmental pathway, such as input, development of children's (non)veridicality vocabulary, and their acquisition of independent semantic knowledge of (non)veridicality.

5 Discussion

This section discusses the kinds the knowledge underlying the child grammar of superweak NPI *shenme* in different phases, and possible factors that may lead to the establishment of that knowledge. The late child grammar will be discussed first, in 5.1; subsequently, the early child grammar will be addressed, in 5.2. Section 5.3 discusses possible ages at which Mandarin children establish the more target-like grammar.

5.1 The late child grammar

As presented in Section 4, the Mandarin children participating in the current experiment show significantly better imitation performance the older they are in all of the five manipulated nonveridical conditions, namely those of negative contexts introduced by a sentential negation, conditional clauses, polar questions, epistemic uncertainty contexts and *wh*-questions. Such results strongly suggest that the late child grammar of *shenme* allows the NPI to systematically appear in a wide range of nonveridical contexts, including *wh*-questions, just as observed for adult language use (cf. Section 2).

Shenme in a variety of nonveridical contexts in late child Mandarin

There are two possible approaches to the late child grammar that allows the superweak NPI to appear in a variety of nonveridical contexts, including *wh*-questions. One approach is to assume that the late child grammar consists of multiple analyses. In particular, it contains a *wh*-analysis that explains *shenme*'s occurrence in *wh*-interrogatives, an analysis that allows *shenme*'s appearance in the scope of a sentential negation, another instance of knowledge that gives rise to *shenme*'s occurrence in conditional clauses, etc. Another possibility of analysing the late child grammar is to hypothesise that

it merely contains one abstract analysis of *shenme*. That is, *shenme* is a superweak NPI, which is licensed in the whole array of nonveridical contexts, including all the above-mentioned semantic environments. A crucial distinction between these two possible views is that the first approach assumes multiple specific analyses of *shenme* whereas the second approach requires merely one abstract NPI analysis. These two views can be schematically presented as follows. Note that *shenme*'s distribution is constrained in both approaches.

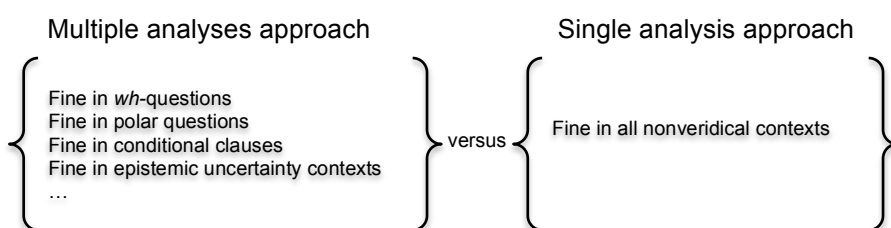


Figure 2: Competing grammars of Mandarin *shenme* in late child language

The analysis of the late child grammar as containing multiple components has two advantages. First, what has already been established in the early child grammar – regardless of what it may consist of or how it has been established – is entirely maintainable. Children do not need to undergo any reanalysing process, but only add additional knowledge explaining *shenme*'s appearance in more types of semantic contexts, such as conditional clauses or polar questions. Second, the multiple-component approach to the late child grammar does not require Mandarin children to acquire the semantic knowledge of (non)veridicality. What children need to acquire merely involves superficial occurrences of *shenme* in a variety of semantic configurations – without having to detect the common semantic property underlying the different licensing conditions for *shenme*.

But this approach is confronted with two challenges. One concerns generalisability. As the multiple-component approach basically assumes that the late child grammar contains specific analyses, each of which only explains *shenme*'s occurrence in one particular type of nonveridical context, it would be a coincidence that such a grammar can generalise a target distributional pattern of the NPI in all kinds of nonveridical environments in Mandarin Chinese (cf. Lin et al. 2014; see also Section 2). Since each component is established based on input evidence only and does not require any insight into the underlying semantic property of the corresponding context, the multiple component approach moreover predicts the acquisition of *shenme* to be successive and individually distinct, depending on the distributional patterns of the NPI by individual speakers. This implies the existence of variations among adult Mandarin speakers with respect to the set of possible licensing conditions for the Mandarin NPI; the distributional pattern of *shenme* being restricted to a unified set of nonveridical contexts would then merely be coincidental.

110 Acquiring Negative Polarity Items

Another problem for this approach is how new, specific analyses can be established. Acquisition proceeds based on input evidence only. However, in child-directed Mandarin, *shenme* is attested in conditional clauses or polar questions only 0.3% of the time, and 0.4% of the time in epistemic uncertainty contexts (see Appendix K).⁶ Given the extremely small amounts of input evidence containing *shenme* licensed in various semantic configurations that are not *wh*-questions or negative sentences, it is questionable whether Mandarin children are able to establish the corresponding knowledge within the first developmental phase, which approximately spans the first three years of their life.

However, in the abstract approach that takes *shenme* in late child Mandarin to be one single element, namely a superweak NPI, this does not seem to be a problem. According to this abstract approach, *input evidence* does not refer to merely the *amount* of input; what is more crucial is rather the *common property* that underlies all kinds of semantic environments (including e.g. *wh*-questions and epistemic uncertainty contexts), in which *shenme* is encountered in the input. This common property is that these contexts are all nonveridical. Thus, based on the abstract approach, what Mandarin children are hypothesised to do in the later developmental phase is not to establish a number of specific analyses based on the extremely small amounts of input evidence containing *shenme* in polar questions or conditional clauses. Instead, what they are hypothesised to do is rather to construct an abstract generalisable analysis of the NPI, having detected the common semantic property underlying all kinds of contexts in which *shenme* is encountered in the input. And children's detection of the common semantic property, which concerns nonveridicality, is possible given the fact that not all the input evidence contains *shenme* used as a *wh*-word.

The abstract approach to *shenme* in late child Mandarin as a superweak NPI moreover generates a distributional pattern of *shenme* being restricted to nonveridical contexts, exactly as is observed in adult language use. The abstract approach to the late child grammar of Mandarin *shenme* relates its limited distribution in nonveridical environments to its status as a superweak NPI, and therefore does not easily allow individual variation. In this scenario, the fact that *shenme* is restricted to a unified set of nonveridical contexts in adult Mandarin is not attributed to coincidence either.

Nonetheless, the single analysis approach has two disadvantages. First, it requires Mandarin children to abandon what they have already established in the initial phase, and undergo a process of reanalysis to construct the abstract NPI analysis. Second, since little research has been reported on the acquisition of (non)veridicality, the abstract approach necessarily assumes that, before establishing the analysis that *shenme* is a

⁶ Distribution data of the superweak NPI *shenme* in the input are collected in three Mandarin subcorpora in the CHILDES database (MacWhinney 2009), namely *Beijing 2* (Tardif 1993, 1996), *Zhou 1* and *Zhou 2* (Zhou 2004a, 2004b), and are presented in Appendix J.

superweak NPI, Mandarin children have already acquired the semantic knowledge of (non)veridicality. That is, they are able to distinguish nonveridical contexts from veridical environments, as they know that only nonveridical contexts do not entail the truth of an embedded proposition.

This paper opts for the single analysis approach to the late child grammar, in which it features merely the one abstract analysis that *shenme* is a superweak NPI, because of its establishability and generalisability – although some of the contexts may appear quite infrequently as licensing conditions for *shenme* in child-directed speech, as well as in adult-to-adult speech. But then the question arises why the generalisable NPI analysis does not allow older children to repeat *shenme* in epistemic uncertainty contexts as often as in the other four manipulated nonveridical environments (see again Section 4.2 and 4.3).

Poor imitation performance in epistemic uncertainty contexts by older children

The most straightforward explanation for older children's poor imitation performance in the test condition of epistemic uncertainty contexts is to assume that these children have not yet acquired the lexical knowledge required in the corresponding licensing conditions. If Mandarin four-year-olds, for instance, do not know how to linguistically express epistemic uncertainty, for example if they have not yet acquired how to say *probably* in their mother tongue, they would of course not be able to repeat the stimuli containing the NPI licenced by such epistemic modal operators. This vocabulary-based explanation is, however, not on the right track. As already mentioned in Section 3.2 (see also Appendix K), Mandarin three-year-olds are already able to linguistically express epistemic uncertainty in their spontaneous speech, by means of epistemic modal adverbs, etc. If production in naturalistic data indicates comprehension and acquisition of relevant phenomena, then lack or non-acquisition of epistemic uncertainty vocabulary cannot be the cause for the older children's poor imitation performance when confronted with epistemic uncertainty stimuli.

Another possible way to understand older children's poor imitation performance in the relevant test condition is to assume that there is a divergence between the manipulated stimuli and the corresponding visual support, in terms of epistemic (un)certainty. Take the following sentence as an example stimulus for the relevant test condition.

- (13) Tiaotiaohu he Weinixiong keneng zhengzai kan
 Tiger with Winnie the Pooh possibly PROG read
 shenme gushi shu.
shenme story book
 'Tiger and Winnie the Pooh are possibly reading a storybook.'

Before hearing this sentence, participants are first presented a picture on a laptop screen in which Tiger and Winnie the Pooh are reading a storybook (see also Section 3.2). This means participants first receive a visual

112 Acquiring Negative Polarity Items

presentation of a factual event, but subsequently hear an audio stimulus containing an epistemic uncertainty activity. The visual support thus does not seem to really support the manipulated stimuli in this test condition. The divergence between the visual support and the audio stimuli in terms of epistemic (un)certainly may therefore result in the poor imitation performance of the older participants., as is predicted by the regression model.⁷

The divergence hypothesised above is confirmed by analysing the four-year-olds' production data detailing how they reconstruct the epistemic uncertainty stimuli in the case of no imitation responses. An overview of relevant data is presented in the table below.

Type of responses		Count (percentage)
Imitation responses		75 (41.7%)
Non-imitation responses	change the stimuli into progressives	44 (24.4%)
	substitute <i>shenme</i> by its bare or plain counterpart	27 (15%)
	change the stimuli into <i>wh</i> -questions	20 (11.1%)
	remove both <i>shenme</i> and the licenser from responses	4 (2.2%)
	incomplete responses	3 (1.7%)
	no responses	3 (1.7%)
	ungrammatical responses	4 (2.2%)
Total		180

Table 1: Observed frequencies of different types of responses to epistemic uncertainty stimuli

The frequency data presented in the table above show that older participants, when they do not give imitation responses, mainly employ three kinds of strategies to reconstruct the manipulated stimuli containing *shenme* appearing in epistemic uncertainty contexts. These strategies are: changing the stimuli into progressive aspects (24.4% of the time), substituting the manipulated *shenme* noun phrase by other existential noun phrases (15% of the time), and changing the stimuli into *wh*-questions by, for instance, adding a Q-marker (11.1% of the time). Examples of children's responses to stimuli such as (13), in which the three strategies are employed, are given in (14a), (14b) and (14c), respectively.

⁷ The divergence between the visual support and the audio stimuli in terms of epistemic (un)certainly would bother younger participants as well; however, since younger children show equally bad imitation performance in the conditions of conditional clauses, of polar questions and of epistemic uncertainty contexts, it is hard to pinpoint whether it is this divergence that explains younger children's poor imitation performance when confronted with epistemic uncertainty stimuli.

- (14) a. Tiaotiaohu he Weinixiong zhengzai kan shenme
 Tiger with Winnie the Pooh PROG read *shenme*
 gushi shu.
 story book
 'Tiger and Winnie the Pooh are reading a storybook.'
- b. Tiaotiaohu he Weinixiong keneng zhengzai kan
 Tiger with Winnie the Pooh possibly PROG read
 (yi-ge) gushi shu.
 one-CL story book
 'Tiger and Winnie the Pooh are possibly reading a storybook.'
- c. Tiaotiaohu he Weinixiong keneng zhengzai kan
 Tiger with Winnie the Pooh possibly PROG read
 shenme gushi shu ne?
shenme story book Q-marker
 'What kind of storybook are Tiger and Winnie the Pooh possibly reading?'

Of the three types of reconstructing strategies, two represent possible ways to reduce the divergence between the visual support and the audio stimuli. The most salient way to do so is by removing the manipulated epistemic modal adverb from responses, which gives rise to sentences containing the NPI *shenme* in a progressive aspect (i.e. (14a)). This strategy is attested 42% of the time if no imitation response is provided (namely 44 out of 105; Table 1).

Changing the epistemic uncertainty stimuli into *wh*-questions, by adding a Q-marker, for instance (i.e. (14c)), can also eliminate the divergence between the visual presentation of a factual event and the audio stimuli representing an epistemic uncertainty activity. When an epistemic uncertainty statement becomes a *wh*-interrogative, it no longer expresses epistemic uncertainty about whether it is a storybook-reading event, or a newspaper-reading event, for instance, but it questions the kind of storybook that the cartoon figures are possibly reading. This strategy is attested 19% of the time when older participants do not repeat the relevant stimuli (i.e. 20 out of 105; Table 1).

The hypothesised divergence between the audio stimuli and the visual support, in terms of epistemic uncertainty, is also supported by results obtained from 31 adult controls. These native speakers of Mandarin Chinese participated in the same elicited imitation task as the child participants. And among all of the five nonveridical test conditions, their lowest ratio of repetition is attested for the condition of epistemic uncertainty contexts, which is 87%. On the other hand, the control group exhibits ceiling imitation performance for all the other nonveridical conditions, namely 93% for *wh*-question stimuli, 99% for negative stimuli, 98% for conditional stimuli, and 95% for polar question stimuli. Obviously, adult speakers are not able to repeat epistemic uncertainty stimuli as often as other nonveridical stimuli either, which appears to support the hypothesised divergence in terms of epistemic (un)certainty.

114 Acquiring Negative Polarity Items

What has been discussed so far strongly suggests that the poor imitation performance by older participants in the test condition of epistemic uncertainty contexts cannot be interpreted as counterevidence to the abstract NPI analysis of *shenme*. Therefore the conclusion is that the late child grammar indeed contains merely one single analysis: that *shenme* is a superweak NPI. However, this analysis necessarily rules out *shenme*'s occurrence in veridical contexts. Why, then, does the regression model predict a significant increase in children's repetition performance for the unlicensed test condition? Does this mean that Mandarin children are developing an overgeneralising grammar of the NPI?

No overgeneralising grammar in late child Mandarin

The significant increase in children's imitation performance predicted by the regression model for the unlicensed test condition at first sight appears to suggest that older Mandarin children are developing a non-target-like grammar that sometimes overgeneralises *shenme* in veridical contexts. However, the apparent development of an overgeneralising grammar of *shenme* in late child language is in fact explained as a consequence of better working memory capacity of the older participants. As mentioned in Section 3.1, the choice of the same stimuli length for all participants, independent of their ages, may result in better imitation performance by the older participants – under the assumption that children's working memory increases with their age. However, the current experiment did not contain any procedure to examine the participants' working memory. There is, nevertheless, indirect evidence indicating that the late child grammar does not generate *shenme* in veridical contexts. This concerns asymmetry attested in the grammaticality of the four-year-olds' responses when confronted with grammatical stimuli in the five test conditions and ungrammatical stimuli in the unlicensed condition. The relevant data are given in Table 2.

	Grammatical stimuli Count (%)	Ungrammatical stimuli Count (%)
Grammatical response	854 (94.9%)	103 (57.2%)
Ungrammatical response	18 (2%)	65 (36.1%)
No response	13 (1.4%)	6 (3.3%)
Incomplete response	15 (1.7%)	6 (3.3%)
Total	900	180

Table 2: Frequencies of different types of responses to (un)grammatical stimuli

When confronted with ungrammatical stimuli containing *shenme* appearing in veridical contexts, namely in the perfect tense, older participants both give ungrammatical responses (36.1%; 65 out of 180), signalling imitation performance of the ungrammatical stimuli, as well as grammatical responses, by correcting the ungrammatical stimuli (57.2%; 103 out of 180).

In contrast, these older participants almost always give grammatical responses to the stimuli that are themselves also grammatical (94.9%; 854 out of 900). This significant asymmetry leads to the generalisation that the children only produce unlicensed *shenme* if the stimuli are themselves ungrammatical ($\chi^2(3, N=1080)=256.308, p=.000$). This asymmetry strongly suggests that *shenme*'s appearance in veridical contexts is not in agreement with the children's own grammar of the NPI; otherwise, older participants would also produce ungrammatical responses to grammatical stimuli. This excludes the possibility that the late child grammar tolerates *shenme* in the perfect tense.

Further evidence for the ungrammaticality of *shenme* appearing in veridical contexts in late child grammar involves the strategies that the four-year-olds employ to correct ungrammatical stimuli. Among the 103 non-imitation responses to the ungrammatical stimuli (namely the grammatical responses to the stimuli in the unlicensed test condition in Table 2), three main categories are distinguished, based on how the older participants correct the ungrammatical stimuli. The four-year-olds either substitute the NPI *shenme* by its bare or plain counterpart (i.e. 72.8%; 75 out of 103), change the ungrammatical stimuli into an epistemic uncertainty context by adding a modal adverb like *haoxiang* 'probably' (i.e. 8.7%; 9 out of 103), or transform the ungrammatical stimuli into a *wh*-question, for instance by adding a Q-marker (i.e. 10.7%; 11 out of 103). These correcting strategies demonstrate that late child grammar does not allow *shenme* to appear in veridical contexts, since older participants either remove *shenme* from perfect tenses or make the veridical contexts nonveridical. Such correcting strategies can only be explained under the assumption that older children have acquired the distributional constraint of the superweak NPI *shenme*.

It is important to note that the CHILDES data reported in Lin et al. (2014; see also Section 2) already reveal that monolingual Mandarin children do not overgeneralise *shenme* in veridical contexts in their spontaneous speech. The two kinds of acquisitional data – obtained from both experiment and corpus research – confirm the learnability of the restricted distribution of the superweak NPI in Mandarin Chinese. The explanation based on working memory capacity, however, gives rise to a crucial question in understanding the significant improvement of the children's imitation performance in the five test conditions. To what extent does the significant increase attested in the participants' imitation probabilities in the four non-*wh* nonveridical conditions represent a development in children's grammar of the NPI *shenme*, rather than merely reflecting their improved working memory capacity?

This question has been addressed by Eisenbeiss (2010), who shows that, although working memory capacity is one of the factors that can affect children's performance in an elicited imitation task, it cannot explain the differences between different test conditions observed for the same participants. The effects of working memory should be similar for the same participant, independent of test conditions. This means that, if it is only working memory that is at play in explaining participants' imitation

116 Acquiring Negative Polarity Items

performance, no significant differences should be found across different test conditions. However, this is not the case. Such significant differences are in fact attested for the four-year-olds ($F(5, 1074)=47.882, p=.000$). Obviously, better working memory is not the only factor explaining the good overall repetition performance of these four-year-olds (except in the test condition of epistemic uncertainty contexts; see previous discussion).

Shenme is a superweak NPI in late child Mandarin

The discussion of the late child grammar of *shenme* leads to the conclusion that older children have developed an NPI analysis of *shenme* that generates its occurrence in different kinds of nonveridical contexts. This means that in late child Mandarin, *shenme* is categorised as a superweak NPI, which is allowed to appear in the whole array of nonveridical contexts but is ungrammatical in veridical environments (cf. Lin et al. 2014; see also Section 2). However, due to practical limitations, the current experiment was restricted to only five kinds of nonveridical conditions when examining older children's knowledge of the superweak NPI. Further research should therefore involve other nonveridical environments, such as in the restriction of a universal quantifier like *meige* 'every', in imperatives or in the complement clause of a non-factive predicate like *dasuan* 'plan', to test the hypothesised abstract analysis of *shenme* as a superweak NPI in late child Mandarin.

5.2 The early child grammar

The previous subsection discusses the late child grammar of the Mandarin NPI *shenme*. It turns out that the grammar established by older children is target-like, as it predicts a distributional pattern of *shenme* restricted to nonveridical contexts only – exactly as observed in adult language use. However, younger participants do not establish such an NPI analysis of *shenme*, as they allow *shenme* to appear in only two of the five manipulated licensing conditions: *wh*-interrogatives and, to a lesser extent, negative contexts introduced by a sentential negation. This seems to suggest that the early child grammar generates *shenme*'s occurrence in these two nonveridical contexts only, which will be further motivated in what follows.

Shenme in *wh*-questions in early child Mandarin

The regression data strongly suggest that as early as the age of 2;11, Mandarin children have already acquired that *shenme* is allowed to appear in *wh*-interrogatives. Throughout the entire investigated age range in this experiment, the regression model predicts an average imitation probability of 0.91 (SD=0.03). The early acquisition of the knowledge that *shenme* can appear in *wh*-questions seems to suggest a *wh*-analysis of the Mandarin NPI is already established before 2;11. But where does this analysis come from?

In order to answer this question, a distributional learning approach is adopted, which was originally proposed for category learning (Cartwright and Brent 1997; Mintz 2002; Mintz et al. 2002; Redington et al. 1998). According to this approach (Mintz 2002, 2003; Mintz et al. 2002), distribution-based

learning plays a crucial role in early language acquisition. Therefore, it is assumed that children's first attempt to analyse the superweak NPI *shenme* relies merely on their investigation of the distributional properties of input data received and processed thus far. This is, moreover, in agreement with what is generally hypothesised for acquisition: it proceeds on the basis of input evidence only (cf. Section 2).

In child-directed Mandarin (which is language input for Mandarin-acquiring children), *shenme* is attested in *wh*-questions 97.7% of the time (see Appendix K). Given its overwhelming occurrence as a question word in the input, it is far from surprising that Mandarin children have established a *wh*-analysis of *shenme* as early as 2;11. The *wh*-analysis of *shenme*, in turn, explains why even the younger children participating in the current experiments are already able to repeat the relevant stimuli at least 90% of the time (cf. Figure 1). Obviously, the distribution-based learning approach helps Mandarin children to make their first step in the acquisition of the superweak NPI *shenme*.

Shenme in the scope of a sentential negation in early child Mandarin

Negative contexts introduced by a sentential negation are proper licensing environments for the superweak NPI *shenme* in Mandarin (Cheng 1994; Huang 1982; Lin 1996, 1998; see also 1.2). However, the early child grammar only allows *shenme* to appear in such negative configurations sometimes: the regression analysis predicts that younger Mandarin children, for instance, below the age of 3;09, are only able to give an imitation response to the relevant stimuli approximately 50% of the time on average (SD=0.26).⁸ Clearly, there is some evidence for the early acquisition of the knowledge that *shenme* can appear in the scope of a sentential negation. But why does this knowledge not always generate *shenme*'s occurrence in the scope of a sentential negation, unlike the *wh*-analysis of *shenme*?

To better understand the nature of younger children's knowledge underlying *shenme*'s occurrence in the scope of a sentential negation, their raw imitation data are analysed further. Four stimuli were manipulated in the test condition for negative contexts. This means that each participant had four chances to score in the relevant test condition. Let's assume that participants have acquired the knowledge that *shenme* can appear in the scope of a sentential negation as an NPI, if they are able to repeat at least three of the four negative stimuli. Similarly, participants are considered not to

⁸ The development predicted for this test condition does not seem to be equally gradual throughout the whole age range investigated in the current experiment. Nonetheless, when looking at the range of fluctuation (cf. Figure 1), it seems that children's imitation performance exhibits a relatively wider range of fluctuation before the age of 3;09 (i.e. 45 months), than later on. This means that children above that age start to repeat the negative stimuli more systematically. The age of 3;09 is therefore assumed to be an age boundary when describing performance differences between younger and older participants.

118 Acquiring Negative Polarity Items

have acquired that knowledge if they are only able to give an imitation response to at most one of the four negative stimuli. Based on these assumptions, younger participants are categorised in three groups depending on their acquisition of the relevant knowledge. See below.

Status of knowledge	Number of participants	Number of stimuli repeated
Acquired	12	≥ 3
Ambiguous	8	2
Not acquired	12	≤ 1
Total	32	4

Table 3: Younger participants' acquisition of the knowledge underlying *shenme*'s occurrence in the scope of a sentential negation

The overview presented above shows that most of the younger participants clearly demonstrate whether they have (N=12) or have not (N=12) acquired the knowledge that *shenme* is allowed to appear as an NPI in the scope of a sentential negation. Only 8 children show an ambiguous imitation performance, when judging whether the knowledge underlying *shenme*'s occurrence in negative contexts introduced by a sentential negation is available to them. Such an ambiguous imitation performance seems to suggest that these participants are actually undergoing the process of acquiring the relevant knowledge. The conclusion that can be drawn from Table 3 is that some young Mandarin children start the acquisition process earlier than others. Such a hypothesis can explain why, in the current experiment, younger participants are predicted to repeat the stimuli containing *shenme* licensed by a sentential negation merely 50% of the time. If the relevant knowledge is only available to some of the younger participants, it is of course not surprising to observe a lower average imitation probability than when the knowledge has been acquired by every child.

Yet, the discussion above may give rise to a further question: what makes *shenme*'s occurrence as an NPI in the scope of a sentential negation special or salient, such that some Mandarin children start earlier in their acquisition of the relevant knowledge than others. The most straightforward way to understand the early acquisition by some Mandarin children is to look at the input frequency. If *shenme* is most often encountered in the scope of a sentential negation, among all other nonveridical contexts that are not *wh*-questions, then it would not be unexpected to observe that children start earlier in using sentential negation to license the NPI in their language development. However, the distributional pattern of *shenme* in child-directed Mandarin does not support this explanation. In fact, *shenme* is never attested in negative contexts introduced by a sentential negation in the language input (cf. Appendix J). Such a distributional pattern would rather predict children to be delayed in their use of sentential negation to license the NPI *shenme* during acquisition. Therefore, more research is needed in

order to find out why some Mandarin children are earlier than others in their acquisition of the knowledge that *shenme* is allowed to appear in the scope of a sentential negation.

Shenme is not yet analysed as an NPI in the early child grammar

What is discussed so far leads to the conclusion that the early child grammar consists of two components: a *wh*-analysis of *shenme* and, for some children, perhaps already some knowledge underlying its occurrence as an NPI in the scope of negation. While the *wh*-analysis is mechanically applicable and acquired by every child, the knowledge underlying *shenme*'s appearance in negative contexts is available to only some, but crucially not all, Mandarin-acquiring children. Is *shenme*, then, already approached as a(n) (superweak) NPI in early child Mandarin?

The answer turns out to be negative. Except for *shenme*'s appearance in *wh*-questions, which are a kind of nonveridical environments (cf. Giannakidou 1997, 1998, 2002, 2011), there is no evidence showing that the early child grammar also allows *shenme* to systematically appear in other kinds of nonveridical contexts. More importantly, the absence of evidence cannot be explained by a vocabulary-based account, which assumes that younger children do not show target-like imitation performance in non-*wh* nonveridical contexts because they lack the vocabulary knowledge required for that. As already mentioned in Section 3.2, all of the manipulated licensing contexts (in particular: sentential negation *bu* 'not' or *mei* 'not', conditional clauses, polar questions and epistemic modal adverbs *haoxiang* 'probably' or *keneng* 'possibly') are frequently and/or systematically attested in spontaneous child speech from the age of three (see Appendix J for relevant frequency data). This suggests that Mandarin children around the age of three have already acquired the vocabulary knowledge required to comprehend and produce the manipulated nonveridical environments. Thus, younger children's poor imitation performance in the test conditions of negative contexts, conditional clauses, epistemic uncertainty contexts and polar questions cannot be explained by a vocabulary-based account. More specifically, if the early child grammar indeed analyses *shenme* as a superweak NPI, why does it only generate its occurrence in the scope of a sentential negation sometimes, but not always? After all, the lexical knowledge of sentential negation is acquired as early as two years old.⁹

5.3 When do children develop the late child grammar?

What is discussed above strongly suggests that the acquisition of the superweak NPI *shenme* in Mandarin Chinese exhibits two developmental phases. In the first phase, children only allow *shenme* to appear in *wh*-

⁹ A total of 327 utterances involving a sentential negative marker are attested in the spontaneous speech data by Mandarin two-year-olds (252 instances of *bu* 'not' and 75 instances of *mei* 'not'). The reader is referred to footnote 5 for relevant corpus information.

120 Acquiring Negative Polarity Items

questions as a question word; and some, but crucially not all, children have already acquired that *shenme* is allowed to appear in the scope of a sentential negation as an NPI. In the subsequent phase, children start to use *shenme* in a wider range of nonveridical contexts than merely *wh*-questions and/or negative environments introduced by a sentential negation. This learning pathway leads to at least two possible grammars of the target NPI, depending on the developmental phase. The early child grammar consists of at least one analysis: a *wh*-analysis, and maybe already a second analysis underlying *shenme*'s occurrence as an NPI in the scope of a sentential negation; whereas the late child grammar merely contains one abstract analysis that *shenme* is a superweak NPI, which survives in nonveridical contexts only. But at what age is this late child grammar established? See the schema below.

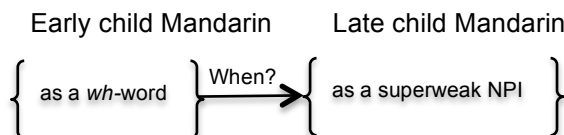


Figure 3: Two grammars in the development of children's knowledge of the Mandarin NPI

Lin et al.'s corpus exploration of the learnability of the Mandarin superweak NPI *shenme* already provides a possible answer to this question (Lin et al. 2014). They also attest two developmental stages in the acquisition of the Mandarin NPI, in which children start with a *wh*-analysis of *shenme* and reanalyse it as a superweak NPI later on (see further Section 2).¹⁰ Moreover, the authors report that the reanalysis of *shenme* as a superweak NPI is established shortly after the age of four, because they only attest a significant difference in the distribution of *shenme* between children below the age of four and those above that age.

However, this does not seem to be in agreement with the regression results obtained in the current experiment. If the late child grammar were indeed established after the age of four, the participants under the age of four are expected to show only limited imitation performance in non-negative or non-*wh* nonveridical test conditions. This is clearly not the case. Based on

¹⁰ A critical reader may already notice a difference between the learning path reported in Lin et al. (2014) and the developmental pattern proposed in the current paper. This difference concerns what the early child grammar consists of. According to Lin et al., the early child grammar only contains a *wh*-analysis of *shenme*; whereas the experimental results presented in this paper also provides evidence for some children's acquisition of the knowledge underlying *shenme*'s occurrence as an NPI in the scope of a sentential negation at early ages. However, this difference is not unexpected, since corpus research restricts the observation to what *is* produced, while experimental research provides insight into what *can be* produced as well.

the regression results illustrated in Figure 1, however, it is difficult to pinpoint an exact age at which Mandarin children develop the late child grammar. This is because these results present a more gradual developmental overview of children's knowledge of the Mandarin superweak NPI *shenme*. Additionally, there is variation among individuals. Nevertheless, the regression results presented in Section 4 (cf. Figure 1) at least suggest that the late child grammar is established at an earlier age than four years old. But before any definitive conclusions can be drawn, further research is needed.

6 Conclusions

This paper examines the learnability of the superweak NPI *shenme* in Mandarin Chinese, which survives only in nonveridical contexts, including *wh*-questions. The experimental results lead to at least two possible grammars of *shenme* during the acquisition. The early child grammar turns out to consist of a *wh*-analysis (arguably with an additional knowledge component underlying *shenme*'s occurrence in the scope of a sentential negation, which is available to some language learners only). The late child grammar contains an abstract NPI analysis that gives rise to *shenme*'s occurrence in the whole array of nonveridical contexts. Thus, the developmental pattern described above tells us that *shenme*'s acquisition exhibits a learning path from a relatively less abstract grammar to a generalisable, abstract grammar. This further leads to the conclusion that even in the absence of negative evidence, such as corrective feedback or explicit instructions on NPIs' ungrammaticality in non-licensing conditions, children are able to detect their distributional constraints. Their strategy is to start with a strict assumption or analysis and weaken it down to a less strict one later in the acquisition (cf. Manzini and Wexler 1987; Snyder 2008; see also Van der Wal 1996).

122 Acquiring Negative Polarity Items

Chapter VI

NPIs of different strengths are NPIs for different reasons: what language acquisition tells us about the nature of NPIs*

Abstract

Negative Polarity Items (NPIs) are words or expressions that are allowed in (semi-)negative contexts only. NPIs come about in different strengths depending on the negativity of their licensing contexts (cf. Zwarts 1995). Strong NPIs survive only in all Anti-Additive contexts and weak NPIs are generally fine in Downward Entailing contexts, while so-called weak/strong NPIs are licensed in all Anti-Additive contexts and in some but not all Downward Entailing contexts. Finally, superstrong NPIs are restricted to Anti-Morphic contexts only, whereas superweak NPIs are fine in all nonveridical contexts. This NPI landscape raises the following question: are NPIs of different strengths NPIs for completely different reasons, or are they all NPIs for the same reason? This paper will explore this question from a perspective of language acquisition. In particular, we will discuss acquisition results of corpus studies on three NPIs, i.e. Dutch *hoeven* 'need', English *any*, and Mandarin Chinese *shenme* 'a/some'. As our results will show, the three acquisitional pathways are similar in that they all show a conservative widening pattern from narrow to wider analyses (cf. Berwick and Weinberg 1984). However, in other respect they differ crucially so that they provide evidence that NPIs of a different strength are NPIs for a different reason. This will lead to the conclusion that the so-called *class of NPIs* does not exist as a grammatical category. It is rather a coincidence that some lexical items superficially display similar distributions restricted to certain negative contexts.

1 Introduction

Negative Polarity Items (NPIs) refer to a class of lexical elements whose distribution is restricted to certain negative contexts only (Ladusaw 1979; Van der Wouden 1997; Zwarts 1981, 1986; among others). Well-studied examples include English *any*. Some examples are provided below, showing that *any* is ungrammatical in the absence of a negation. The negation is underlined and the NPI is marked in italics.

* This chapter is adapted from Lin, Jing, Fred Weerman, and Hedde Zeijlstra. (To be submitted). NPIs of different strengths are NPIs for different reasons: what language acquisition tells us about the nature of NPIs.

124 Acquiring Negative Polarity Items

- (1) a. John did not buy *any* linguistic books yesterday.
 b.* John bought *any* linguistic books yesterday.
- (2) a. Nobody bought *any* linguistic books yesterday.
 b.* Somebody/*John/*I bought *any* linguistic books yesterday.
- (3) a. John went home yesterday without *any* linguistic books.
 b.* John went home yesterday with *any* linguistics books.

NPIs form a cross-linguistic phenomenon (Haspelmath 1997) and may vary cross- and intra-linguistically in strength. The strength of an NPI is categorised depending on the type of negative contexts in which it can and cannot be licensed (Hoeksema 2000; Nam 1994; Van der Wouden 1997; Zwarts 1986, 1995, 1998). Although four types of negative environments are distinguished in the literature, i.e. Anti-Morphic (AM), Anti-Additive (AA), Downward Entailing (DE), and nonveridical contexts (NV), five NPI strengths can be attested.¹ They are superstrong NPIs, strong NPIs, strong/weak NPIs, weak NPIs, and superweak NPIs. Table 1 provides a typology of NPIs depending on their strengths.

Strength	AM	Non-AM, AA	Non-AA, DE	Non-DE, NV
Superstrong	Yes	No	No	No
Strong	Yes	Yes	No	No
Strong/weak	Yes	Yes	Some but not all	No
Weak	Yes	Yes	Yes	No
Superweak	Yes	Yes	Yes	Yes

Table 1: NPIs of different strengths and the corresponding licensing condition (cf. Zwarts 1981, 1986, 1995; see also Van der Wouden 1994).

Ladusaw (1996) summarises four research questions in the study of NPIs, of which the *licensee* question is the focus in this paper. The *licensee* question aims to investigate the reason(s) why NPIs are restricted to certain negative contexts only. The literature so far exhibits three main approaches to the *licensee* question: a syntactic approach originating from Klima (1964), followed and modified by Postal (2000) and Szabolcsi (2004), which treats polarity sensitivity as a consequence of a lexical dependency with an

¹ The first three types of negative contexts mentioned here are categorised depending on their logico-semantic behaviour. For every arbitrary X, Y : if $f(X \cap Y) \leftrightarrow f(X) \cup f(Y)$ and $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$, then the function f is Anti-Morphic; iff $f(X \cup Y) \leftrightarrow f(X) \cap f(Y)$, then the function f is Anti-Additive; if $f(X \cup Y) \rightarrow f(X)$ and/or $f(X \cup Y) \rightarrow f(Y)$, then the function f is Downward Entailing (definitions adapted from Van der Wouden 1997). The notion of nonveridicality is defined in terms of truth: a propositional operator F is veridical, iff Fp entails p ($Fp \models p$); otherwise F is nonveridical (definition taken from Zwarts 1995; see also Giannakidou 1997).

abstract negation NEG; a syntactico-semantic approach by Chierchia (2004, 2006, 2013) based on Kadmon and Landman (1993) and Krifka (1995), which takes NPIs to bear a σ -feature that must be checked against by a covert exhaustifier via syntactic feature checking, generating NPIs' ungrammaticality in non-licensing contexts as a consequence of a logical contradiction; and an approach in terms of referential deficiency (cf. Giannakidou 2010, 2011; Giannakidou and Quer 2013), which assumes NPIs to be non-referential existentials.²

At first sight, it appears that these approaches are competitive as they are all proposed to answer the same *licensee* question. Nevertheless, the three approaches hypothesise completely different properties underlying NPI-hood (an abstract negation NEG, a σ -feature, and non-referentiality), which in turn give us distinct distributional patterns of NPIs in natural languages. Therefore, they do not necessarily have to be competitive. After all, nothing excludes the co-existence of NPIs that have gained polarity sensitivity for different reasons; in fact, different distributional patterns may already indicate different properties underlying NPI-hood.

Given this background, the landscape of NPIs in Table 1 raises a research question that has not yet been thoroughly investigated in the existing body of literature. Have NPIs of different strengths all become polarity sensitive for the same reason (which is, are the three approaches competitive), or are they NPIs for completely different reasons (which is, do the three approaches only appear to be competitive)?

To investigate this question, we choose to look at language acquisition in this paper. We justify why language acquisition is a good test field for our research question as follows. The two perspectives on NPI-hood hypothesised above make different predictions for the degree to which acquisitional pathways of NPIs of different strengths are uniform. If all NPIs share a similar underlying explanation for their restricted distributions, one would expect a similar acquisitional pathway of all NPIs, irrespective of strength – at least from the onset. If, by contrast, the landscape of NPIs in Table 1 is indeed heterogeneous such that it hosts different NPIs that are NPIs for different reasons, one would also expect distinct acquisitional patterns of such NPIs. Empirical data from children acquiring NPIs can therefore offer novel insight into our understanding of the nature of NPIs.

Moreover, our acquisitional perspective on NPI-hood might also shed light on the existence of the *class of NPIs* as defined in earlier work by Ladusaw (1980), among others. Van der Wouden (1997) already points out that the so-called NPIs might only appear to manifest themselves as one phenomenon as they all exhibit a restricted distribution to one or another set of negative contexts as summarised in Table 1. Therefore, if we indeed find

² Other approaches to the *licensee* question include Hoeksema (1994), who assumes NPIs to be distinguishable from other polarity insensitive items in their semantics; and Israel (1997, 1998, 2001, 2004), who explains polarity sensitivity from a more pragmatic perspective.

evidence that NPIs of different strengths are acquired via different learning paths, leading to different properties underlying different NPIs in adult grammar, we can conclude that the *class of NPIs* does not actually exist as a grammatical category. It is then just a coincidence that some lexical items superficially present similar restrictions to certain negative contexts; in reality, they have completely different reasons for that restriction.

The acquisition of NPIs has received little research attention (see a summary in Lin et al. 2015). Nevertheless, as one of the few studies on the topic, Van der Wal (1996) presents an idea of what a unified developmental pathway of different NPIs might look like. Van der Wal employs a subset relationship among the four types of negative contexts as her theoretical background on which the acquisitional pathway of NPIs is projected. This relationship can also be presented in the form of a hierarchy, as shown below.³

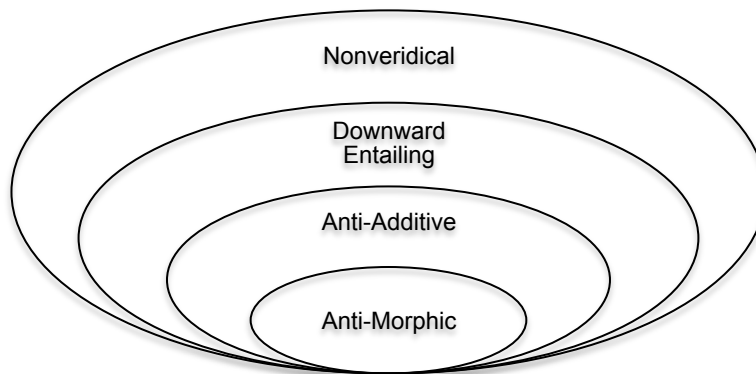


Figure 1: The subset relationship between the four types of negative contexts

By hypothesizing a conservative widening learning strategy (after Berwick and Weinberg 1984; Manzini and Wexler 1987), Van der Wal argues for a developmental pathway of NPIs from narrow to wider generalisations (Van der Wal 1996: 1.7.4).⁴ Children always start off with the strictest assumption

³ This hierarchy is adapted from Zwarts (1981, 1986, 1995), Giannakidou and Zwarts (1999). In the original hierarchy of negative expressions by Zwarts, Anti-Morphic operators are categorised as *classical negation*, Anti-Additive contexts are termed as *regular negation*, and Downward Entailing conditions are defined as *minimal negation*.

⁴ Van der Wal (1996) adopts a conservative widening learning mechanism to be responsible for the acquisition of NPIs because this learning strategy can prevent children from making overgeneralisation errors of NPIs that cannot be unlearned in the absence of negative evidence during a language acquisitional trajectory. We refer the readers to Van der Wal (1996), Tieu (2013), and Lin et al. (2015) for a related discussion.

that every NPI is a superstrong NPI that can only appear in Anti-Morphic contexts. This is the safest initial hypothesis that a child can ever make as all NPIs are always fine in at least Anti-Morphic contexts, which are the strongest type of negative contexts (Zwarts 1995; Van der Wouden 1997). At a subsequent stage of acquisition, if children are confronted with input evidence that falsifies the hypothesis that NPIs are superstrong, they weaken the initial assumption by reanalysing NPIs to be of a weaker strength, namely as strong NPIs allowed in all Anti-Additive contexts. According to language input, children thus extend their hypothesis of NPIs by reanalysing them to be of an ever weaker strength licensed in an ever wider set of negative contexts alongside the hierarchy, until eventually the adult set of licensors for each individual NPI is established.

This conservatively widening pathway of acquisition alongside the hierarchy of negative expressions is hypothesised by Van der Wal for all NPIs. This means that if NPIs of different strengths have indeed become NPIs for a similar underlying reason, such a universal pattern is likely to be attested irrespective of their strengths.⁵ Thus, regardless of the property children need to acquire for NPIs of different strengths (the abstract negation, the σ -feature, or the non-referentiality), the acquisitional paths of NPIs should all follow a widening pattern from Anti-Morphic contexts to weaker negative contexts alongside the hierarchy.

In order to examine whether the developmental paths of different NPIs are unified or distinct, we conducted three corpus studies to investigate the acquisition of NPIs of different strengths. They are strong/weak NPI *hoeven* 'need' in Dutch, which survives only in Anti-Additive contexts, some but not all Downward Entailing environments, weak NPI *any* in English, which is allowed in different Downward Entailing contexts plus questions, and superweak NPI *shenme* 'a/some' in Mandarin Chinese, which is fine in a variety of nonveridical contexts. As this paper will demonstrate, the acquisitional pathways of these different NPIs are different, although they all show the same conservative widening learning strategy.

Rather, the acquisition of the three NPIs displays a distinct pattern: Dutch *hoeven* from Anti-Morphic contexts to Anti-Additive contexts, English *any* from Anti-Morphic contexts and polar questions to Downward Entailing environments, and Mandarin *shenme* from *wh*-interrogatives to a variety of nonveridical contexts. These distinct learning paths lead to different analyses of the NPIs. This brings us to conclude that NPIs of different strengths are NPIs due to completely different reasons. All three approaches to NPI-hood are correct; there exists no single class of NPIs as a grammatical category.

We organise the paper as follows. Section 2 introduces and discusses the three approaches to NPI-hood in greater detail. Section 3 presents the methodology. Section 4 presents the results. Section 5

⁵ Although a universal learning path is expected, developmental pathways of NPIs may end up at different layers in the negative hierarchy depending on their strengths.

demonstrates that although the same conservative widening learning mechanism is responsible for the acquisition of all the NPIs, distinct acquisitional pathways are attested for the NPIs of different strengths. Section 6 concludes the paper.

2 Three approaches to the *licensee* question

This section briefly introduces the three approaches to NPI-hood discussed above. They are the syntactic approach of Postal (2000), originating from Klima (1964); the syntactico-semantic approach of Chierchia (2004, 2006, 2013), based on Kadmon and Landman (1993) and Krifka (1995); and the non-referential approach of Giannakidou (2010, 2011) (see also Giannakidou and Quer 2013). These are presented in 2.1, 2.2, and 2.3, respectively. Furthermore, we specifically argue in 2.4 that the three approaches to NPI-hood are not competitive; in fact, we propose that strong/weak NPIs are NPIs for the reason Postal has argued; weak NPIs for the reasons suggested by Chierchia and superweak NPIs resulting from Giannakidou's mechanism.

2.1 Polarity as a result of incorporated negation (Postal 2000)

The basic assumption of the syntactic approach to the *licensee* question is that the distribution of NPIs being limited to negative contexts only is accounted for by a certain syntactic requirement. This idea dates back to Klima (1964), where NPIs are claimed to be subject to some syntactic constraint that restricts them to negative expressions only. This implies that the occurrence of NPIs in affirmative environments should lead to a violation of some syntactic rule.

Progovac (1994, 2000) follows this basic idea and claims that NPIs are analysed as a special instance of syntactic binding. In the same vein, Laka (1990) provides an explanation for the *licensee* question by incorporating of a syntactic constraint in the grammar involving the obligatory presence of an affective phrase (ΣP). From a lexico-syntactic perspective, Postal (2000) hypothesises that NPIs always carry a negation (NEG) in their underlying lexical structure, such as that illustrated below.⁶

(4) [NEG NPI]

For Postal, licensing of an NPI takes place when the negation NEG, which is part of the lexical representation of an NPI, first moves out to a higher position and is then phonologically realised as either an overt negative marker or incorporated into a negative expression. Taking English *any* as an example, the movement of NEG from its underlying syntactic representation

⁶ This crucial claim of Postal's approach is adopted and modified in other works as well, e.g. Szabolcsi (2004).

to a higher position at surface structure can be seen in the example below, in which NEG is spelled out as the sentential negative marker *not*.

- (5) John did not_i [= NEG] buy t_i-*any* linguistic books yesterday.

Adopting Jacobs' syntactic decompositional analysis of negative indefinites (1980), originally proposed for German, negative quantifiers (at least in the Germanic languages) can be analysed as containing a NEG in their underlying lexical or syntactic structures, as illustrated in Figure 2 (see also Rullmann 1995; Zeijlstra 2011; among others).⁷ If that is correct, negative indefinites just like *nobody* license *any* the same way as in (6) because they contain a NEG as well. Here we see that the NEG incorporated in the underlying lexical representation of the NPI is spelled out as part of the negative quantifier.



Figure 2: Decompositional analysis of negative quantifiers in English

- (6) Nobody_i [=NEG a person] bought t_i-*any* linguistic books yesterday.

Following the decomposable analysis of negative operators illustrated in Von Stechow and Lasnik (2003) (see also Horn 1996), Penka (2011), and Lasnik and Zeijlstra (2013), the NEG is also decomposable from semi-negative expressions such as *few*, exclusive adverbs such as *only*, etc. Given Postal's proposal, the appearance of NPIs such as *any* in these contexts can therefore be explained as in (7), in which the NEG is spelled out as part of *seldom* and *only*.

- (7) a. John seldom_i [=NEG often] buys t_i-*any* linguistic books.
 b. Only_i [=NEG EXCEPTIVE] John bought t_i-*any* linguistic books.

Postal's proposal has been criticized because not every NPI licensing context can be decomposed as containing a negation and some other element. Downward Entailing contexts such as conditional clauses or the first argument of universals do not seem to contain a NEG and should therefore be expected to fail to license NPIs. Let us employ the term *NEG-DE* to refer to those Downward Entailing environments, from which a NEG is

⁷ The syntactic decomposable structure of Germanic negative indefinites is motivated by the existence of so-called split-scope readings of negative indefinites. Due to space limitations, we refer the reader to Rullmann (1995), Penka and Zeijlstra (2005), Penka (2012), Zeijlstra (2011), and Lasnik and Zeijlstra (2013) for illustration.

decomposable, and illustrate this subset of DE-contexts in the negative hierarchy as follows.⁸

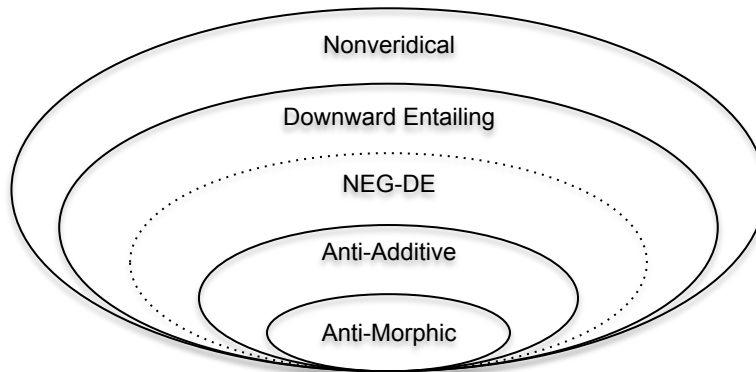


Figure 3: The adapted negative hierarchy

The distributional pattern of an NPI licensed by a possibly incorporated negation must then be restricted to NEG-DE only and is not as same as that of *any*, which can be licensed in all Downward Entailing contexts (cf. Ladusaw 1979). Indeed, we argue that strong/weak NPIs in terms of the typology in Table 1 are exactly such NPIs.

Dutch modal verb *hoeven* 'need' is a NPI of such a strength. *Hoeven* is restricted to all Anti-Additive contexts and some but not all Downward Entailing environments (Van der Wouden 1997; Zwarts 1981, 1986, 1995). As shown in (8a-d), *hoeven* is allowed in different Anti-Additive contexts. In Downward Entailing contexts that are analysed as containing a decomposable NEG (Iatridou and Zeijlstra 2013; Penka 2011; Von Stechow and Iatridou 2003), such as those in (9a-d), *hoeven* is fine as well: in the scope of semi-negative operators *zelden* 'seldom', a negative universal expression *niet iedereen* 'not everybody', or an exclusive adverb *alleen* 'only', respectively. However, *hoeven* cannot be licensed in the restrictive clause of a universal *iedereen* 'everybody' as shown by (10a) or a conditional clause as in (10b) – two Downward Entailing contexts that do not contain a decomposable NEG.

- (8) a. Jan *hoeft niet* te koken.
 John needs not to cook
 'John does not have to cook.'
- b. *Niemand hoeft* te koken.
 nobody needs to cook
 'Nobody has to cook.'

⁸ We follow Von Stechow (1999) and categorise exclusives adverbs such as English *only* (and its Dutch counterpart *alleen* 'only' as a specific kind of Downward Entailing operators.

- c. Jan eet vaak thuis zonder te *hoeven* koken.
 John eats often home without to need cook
 'John often eats at home without having to cook.'
- d. Jan kookt altijd vaker dan hij *hoeft* (te koken).
 John cooks always more often than he needs (to cook)
 'John always cooks more often than he has to (cook).'
- (9) a. Jan *hoeft* zelden te koken.
 John needs seldom to cook
 'John seldom has to cook.'
- b. Niet iedereen *hoeft* in het weekend te koken.
 not everybody needs in the weekend to cook
 'Not everybody has to cook in the weekends.'
- c. Jan *hoeft* alleen te koken.
 John needs only to cook
 'John only has to cook.'
- d. Alleen Jan *hoeft* te koken.
 only John needs to cook
 'Only John has to cook.'
- (10) a.* Iedereen die *hoeft* te koken moet nu beginnen.
 everyone COMP needsto cook must now start
 Intended: 'Everyone that has to cook must start now.'
- b.* Als Jan *hoeft* te koken moet hij nu beginnen.
 if John needsto cook must he now start
 Intended: 'If John has to cook then he must start now.'

These examples illustrate that *hoeven* is indeed restricted to what we call NEG-DE (cf. Figure 3). Lin et al. (2015) confirm this distributional pattern based on their data collected from *het Corpus Gesproken Nederlands* 'The Spoken Dutch Corpus' (Oostdijk 2004). The relevant data are presented in Appendix O.

2.2 Polarity as a result of obligatory exhaustification (Chierchia 2004, 2006, 2013)

A second approach to the *licensee* question of NPIs such as *any* is the semantic approach by Chierchia (2004, 2006, 2013), developed from previous work on this NPI by Kadmon and Landman (1993) and Krifka (1995). Following these previous studies, Chierchia assumes that *any* occupies the lowest position of a relevant scale (introducing higher scalar alternatives) and that *any* is a domain widener that automatically activates the largest domain D associated or inferred by the discourse context, introducing subdomains of D as its domain alternatives (DAs). Chierchia further assumes that *any* is subject to obligatory application of an abstract exhaustification operator (O) to both is SAs and DAs by postulating a σ -feature on *any* that needs to be checked against by this covert exhaustifier.

132 Acquiring Negative Polarity Items

The σ -feature is both a lexical semantic feature (as it marks the focus of a proposition) and a formal feature (as it requires syntactic checking by an abstract exhaustifier). When the abstract operator O applies to a proposition p , it is exhaustified, which entails that p is true and that all stronger scalar and domain alternatives are false:

$$(11) \quad O(p) = p \wedge \forall q \in \text{Alt}(p)[p \not\subseteq q \rightarrow \neg q]$$

When *any* introduces DAs, its σ -feature restricts the NPI to Downward Entailing contexts. Consider the following example, in which *any* appears in the scope of a Downward Entailing operator *not*. The utterance (12a) has the meaning in (12b), namely that John did not read a book in domain D . *Any*'s σ -feature requires the obligatory application of O , which triggers the process of exhaustification of (12a). This results in an exhaustive reading of this utterance that all its stronger alternatives are logically false. *Any* automatically activates the largest domain D and introduces all smaller subdomains D_1 to D_n of D , where $1 \leq i \leq n$, as domain alternatives. The propositions in (12c) are thus all domain alternatives of (12b). However, given the presence of the negation, all domain alternatives in (12c) are entailed by (12b) and therefore exhaustification has no effect and there is no reason why (12a) would be bad.

- (12) a. John did not read *any* book.
 b. $\neg \exists x \in D [\text{book}(x) \wedge \text{read}(\text{John}, x)]$
 c. $\neg \exists x \in D_i [\text{book}(x) \wedge \text{read}(\text{John}, x)]$

However, this does not hold when *any* appears in simple affirmative contexts that are not Downward Entailing. Suppose that *any* would be acceptable in such environments: when a speaker utters (13a), s/he would mean (13b). Given that *any* is a domain widener, it activates subdomains D_1 to D_n as its alternatives. However, now every DA of (13b) is stronger than (13b) itself. Exhaustifying (13a) then leads to an exhaustive interpretation that (13b) is true but that all its stronger domain alternatives of (13b), listed in (13c), are false. Thus (13d) holds for every DA D_1 to D_n of D . But if all alternatives in (13c) are false, (13b) must be false as well. This yields a semantic contradiction: John read a book in a certain domain D (which is (13b)) and he did not read a book in any subdomains of D (which is (13d)). The logical contradiction that arises when a proposition containing *any* outside Downward Entailing context is the reason for Chierchia why *any* is unacceptability in such sentences.

- (13) a. John read *any* book.
 b. $\exists x \in D [\text{book}(x) \wedge \text{read}(\text{John}, x)]$
 c. $\exists x \in D_i [\text{book}(x) \wedge \text{read}(\text{John}, x)]$
 d. $\neg \exists x \in D_i [\text{book}(x) \wedge \text{read}(\text{John}, x)]$

This brief illustration of Chierchia's approach leads to a generalisation that NPIs bearing a σ -feature can only survive in Downward Entailing contexts. This gives us the distributional pattern of a typical weak NPI in terms of the typology in Table 1, limited to the layer of Downward Entailing contexts in the hierarchy in Figure 3.⁹

As is well studied in the literature (Horn 1996, 2000, 2005; Kadmon and Landman 1993; Krifka 1995; Ladusaw 1979, 1996), weak NPIs such as *any* are attested in a variety of Downward Entailing contexts. In addition, they also appear in (embedded) polar questions, which cannot be straightforwardly analysed as Downward Entailing. Two examples are given below.

- (14) a. Did John buy *any* linguistic books?
b. I wonder if/whether John bought *any* linguistic books.

Any's acceptability in such interrogatives can be explained based on Chierchia's exhaustive approach as follows. As Guerzoni and Sharvit (2007) illustrate, polar questions are always interpreted as strongly exhaustive (see also Beck and Rullmann 1999; Heim 1994; Sharvit 2002). According to Nicolae (2013), strong exhaustive questions always contain a covert *only*, which renders the question nucleus a Downward Entailing operator and therefore guarantees *any*'s acceptance in these questions.

Besides appearing in (embedded) polar questions, *any* can also be found in (embedded) *wh*-questions. However, *any* is not always allowed in such questions. For example, *any* is not acceptable in the subject position of *wh*-interrogatives.

- (15) a. Who bought *any* linguistic books?
b. I asked the professor who bought *any* linguistic books.

- (16) a.* What kind of books did *any* students buy?
b.* I asked the professor what kind of books *any* students bought.

⁹ Chierchia's approach also provides an explanation for the distributional patterns of strong NPIs. According to this author, both strong and weak NPIs carry a σ -feature. However, whereas weak NPIs are only sensitive to truth-conditional content of an assertion, strong NPIs are also sensitive to the enriched meaning of an assertion, namely what is asserted plus its presuppositional/implicature component. As Downward Entailing contexts that are not Anti-Additive (i.e. conditional clauses) have a positive presupposition and/or implicature, strong NPIs such as *in weeks* are ruled out in such environments due to failed exhaustification. On the other hand, weak NPIs such as *ever* or *any* ignore the presuppositional/implicature component of their environments and thus they survive. The reader is referred to Chierchia (2013) for a detailed explanation in this respect.

Again, *wh*-interrogatives are not Downward Entailing in an obvious way. Due to space limitations we do not discuss how Chierchia's approach captures *any*'s distribution in *wh*-interrogatives but refer the reader to a recent work by Nicolae (2013), in which the author provides a systematic account for *any*'s acceptability in *wh*-interrogatives based on Chierchia's semantic approach to NPI-hood (see also Guerzoni and Sharvit 2007).

The distribution of weak NPIs such as *any* as illustrated above is also confirmed by data collected from the spoken corpora of the British National Corpus (BNC). These corpus results are summarised in Appendix P.

2.3 Polarity as a result of non-referentiality (Giannakidou 2002, 2011)

Taking a different perspective and also focusing on NPIs in languages other than English, Giannakidou (1998, 2002, 2010, 2011) employs the notion of referential deficiency to account for the limited distribution of some Greek NPIs that survive only in nonveridical contexts, e.g. *tipota* 'anything' or *kanenas* 'anybody'. The central claim of this (non-)referential approach is that NPIs cannot appear in simple affirmative contexts, because they are referentially deficient. In terms of discourse representation theory, such non-referential NPIs cannot introduce or refer to a discourse referent. Due to this deficiency, NPIs must always appear in a semantic context that does not require obligatory referring, e.g. under the scope of a negation.

We know that most noun phrases (NPs), for example, are referential and can therefore be employed to refer; but whether an NP is obligatory to refer depends on the type of semantic context. For this point, compare the following sentences.

- (17) a. I am looking for *a book* on a round table.
 b. I read *a book* yesterday.
- (18) a. John is searching for *a car* with four cylinders.
 b. John bought *a car* last year.

In both a-sentences, the NPs *a book* and *a car* refer to an entity that suffices the description of these indefinite NPs given by the context. However, these NPs are not obligatory to refer, as it might be the case that there exists no entity such that it is a book or a car, sufficing the description given by the context. In both b-sentences, on the other hand, referring by the same NPs becomes obligatory. This is because both b-utterances necessarily require the existence of at least one entity that suffices the description of it provided in the context.

NPs such as *a book* in (17) and *a car* in (18) are termed as *free variables* in Giannakidou (2011). The a-sentences above show that free variables can introduce a discourse referent in a main context; the b-sentences above show that free variables can also refer to existing individuals – although not always obligatory. *Dependent variables*, on the other hand, cannot introduce a discourse referent, nor can they refer to any

existing individuals (Giannakidou 2011). This means that dependent variables cannot be assigned a fixed value from the context. Hence, they must be constrained in contexts where there is an operator they can be bound by and be in the scope of.

Following Giannakidou's assumption that NPIs contain a dependent variable that cannot introduce or refer to any discourse referent, she comes to the generalisation that NPIs can only be uttered in semantics contexts that do not induce any existential import (see also Lin 1996, 1998). As Giannakidou claims, since nonveridical contexts do not entail the truth of an embedded proposition, they do not require obligatory introduction of or reference to a variable. Therefore, NPIs containing a dependent variable in terms of Giannakidou (2011) can only survive in the whole array of nonveridical contexts. Based on the typology of NPIs in Table 1, we therefore conclude that NPIs that are referential deficient in the way that Giannakidou hypothesises must be superweak NPIs.

Giannakidou (1997, 1998), Giannakidou and Quer (2013), and Giannakidou and Yoon (2011) illustrate a number of Greek and Korean NPIs that are restricted to nonveridical environments only due to their non-referentiality (*kanenas*, *tipota* in Greek and *rato*-terms in Korean). However, these NPIs have a more limited distribution compared to *shenme* 'a/some' in Mandarin Chinese, which indeed shows the distributional pattern of a prototypical superweak NPI in all nonveridical contexts only, as recently exemplified in Lin et al. (2014).

Examples below illustrate this distribution of the Chinese NPI *shenme* in Anti-Morphic contexts in (19), Anti-Additive but not Anti-Morphic contexts in (20), Downward Entailing but not Anti-Additive contexts in (21), and nonveridical contexts that are not Downward Entailing in (22), including both polar questions and *wh*-interrogatives (Cheng 1991, 1994; Huang 1982; Lin 1996, 1998, among others).

- (19) a. Yuehan mei mai *shenme* shu.
 John not buy a book
 'John did not buy any book(s).'
- b. Ni bie rang ta mai *shenme* shu.
 you not let him buy a book
 'You should not let him buy any book(s).'
- (20) a. Zuotian meiren mai *shenme* shu.
 yesterday nobody buy a book
 'Nobody bought any book(s) yesterday.'
- b. Ta congwei mai guo *shenme* shu.
 s/he never buy PERF a book
 'S/he never bought any book(s).'
- (21) a. Mei ji ge ren mai guo *shenme* shu.
 few people buy PERF a book
 'Few people bought any book(s).'

136 Acquiring Negative Polarity Items

- b. Yuehan *shenme* shu dou xihuan kan.
 John a book all like read
 'John likes to read every book.'
- c. Meige yao gei nvpengyou mai *shenme* liwu de
 every want for girlfriend buy a gift REL
 nansheng dou hui dedaota de yige wen.
 boy all will get s/he GEN one kiss
 'Every boy that wants to buy a gift for his girlfriend will get a kiss
 from her.'
- d. Ruguo Yuehangei ni mai guo *shenme* liwu, ni
 if John for you buy PERF a present you
 yiding yao haohao xiexie ta.
 certainly should well thank him
 'If John has bought any present(s) for you, you should thank him a lot.'
- (22) a. Yuehan keneng mai le *shenme* shu.
 John maybe buy PERF a book
 'Maybe John has bought some book(s).'
- b. Yuehan mai *shenme* shu le me?
 John buy a book PERF Q
 'Has John bought any book(s)?'
- c. Yuehan buy le *shenme* shu (ne)?
 John buy PERF a book Q
 'What kind of book(s) has John bought?'

As is typically observed for all NPIs, *shenme* does not survive in veridical contexts such as simple past tense, as shown in (23a). Moreover, *shenme* is not allowed in the scope of an exclusive adverb *zhiyou* 'only' as in (23b) or a focus marker *shenzhi* 'even' in (23c).¹⁰

¹⁰ Cheng (1994) also observes that the appearance of *shenme* raises ungrammaticality in the subject position of Mandarin X-NEG-X questions, a specific type of polar question in Mandarin Chinese. *Shenme*'s ungrammaticality in this position is demonstrated below.

(i) * Shenme shu gui bu gui (ne)?

a book expensive not expensive Q

Intended: 'Are (some/any) books expensive or not?'

(ii) * Ta xiang zhidao shenme shu gui bu gui.

s/he wonder a book expensive not expensive

Intended: 'S/he wonders if (some/any) books are expensive or not'

Cheng (1994) explains *shenme*'s ungrammaticality in sentences like (i) and (ii) as a consequence of a violation of the syntactic constraint on NPI licensing. We refer the reader to Cheng for this explanation due to space limitations.

- (23) a.* Yuehan zuotian mai le *shenme* shu.
 John yesterday buy PERF a book
 Intended: 'John has bought (a) book(s) yesterday.'
- b.* Zuotian zhiyou Yuehan mai le *shenme* shu.
 yesterday only John buy PERF a book
 Intended: 'Only John has bought (a) book(s) yesterday.'
- c.* Zuotian jiuilian Yuehan dou mai le *shenme* shu.
 yesterday even John all buy PERF a book
 Intended: 'Even John has bought (a) book(s) yesterday.'

Lin et al. (2014) also present corpus data collected from a subcorpus of the *PKU-CCL YuLiaoKu* (the PKU-CCL Corpora), in particular *KouYu* 'spoken Mandarin'. These data confirm the distributional pattern that Giannakidou's (non-)referential approach generates for superweak NPIs like *shenme*, namely restricted to different kinds of nonveridical contexts only. We refer the reader to Appendix Q for the relevant corpus data.

2.4 No competitive approaches to NPI-hood

Above we summarise three main approaches to the *licensee* question in the literature. Postal's syntactic approach takes the incorporated abstract negation NEG in NPIs' underlying lexical representation to explain why NPIs are NPIs. Although this proposal aims to explain the nature of NPIs such as *any*, it merely generates the distribution of NPIs in negative contexts containing a decomposable NEG. This is in fact a typical distributional pattern of strong/weak NPIs such as Dutch *hoeven* 'need'. Chierchia's answer to the *licensee* question combines both the constraint of feature checking required by NPIs [σ] and the semantic requirement that the appearance of NPIs must not give rise to any inherent contradiction. This predicts NPIs to be only licensed in Downward Entailing contexts and (polar) questions, as is generally observed for weak NPIs such as *any* (although, as discussed earlier, (polar) questions are not straightforwardly Downward Entailing). Finally, by assuming that NPIs are all referentially deficient and fail to introduce or refer to any discourse referent, Giannakidou abstracts NPIs' polarity sensitivity as an instance of non-referentiality. This leads to a distributional pattern of NPIs in nonveridical contexts only – a distributional pattern that superweak NPIs like Mandarin *shenme* 'a/some' exhibit.

The distributional pattern of NPIs generated by each of the approaches corresponds perfectly to the distribution of NPIs of different strengths as shown in Table 1: strong/weak NPIs, weak NPIs, and superweak NPIs.¹¹ This already leads to the conclusion that the three

¹¹ As already mentioned, Chierchia's σ -feature also explains the distributional pattern of strong NPIs, i.e. restricted to Anti-Additive contexts only. Since superstrong NPIs, which are licensed by Anti-Morphic operators only (i.e. sentential negation), are mostly idiomatic expressions (Hoeksema 1994; Van der Wouden 1997), we assume that they have become polarity

approaches to NPI-hood need not be competitive; they all explain why NPIs have gained polarity sensitivity because each of them addresses NPIs of a different strength.

In fact, none of these approaches is able to explain the nature of all NPIs irrespective of their types of strength. Based on Postal's treatment of NPIs, it is impossible to maintain that superweak NPIs such as Mandarin *shenme* that survive in all nonveridical contexts have an abstract negation NEG in their underlying representation. After all, it is almost impossible to decompose an abstract negation NEG in affirmative imperatives or progressives, etc., which are licit licensers for superweak NPIs as discussed in Lin (1996, 1998), Xie (2007), Lin et al. (2014), Lin and Giannakidou (Submitted), without overgeneralising to non-licensing contexts. Moreover, Postal's approach to NPI-hood is too limited to explain why low-scale items or minimisers such as *any* are good candidates for typical weak NPIs, fine in all Downward Entailing environments where the direction of the entailment relation is reversed (cf. Fauconnier 1978).

On the other hand, both Chierchia's σ -feature and Giannakidou's non-referentiality only work for existential/indefinite NPIs, just like English *any*-terms, Greek *kanenas*-terms, Korean *rato*-terms, and Mandarin *shenme*-terms, although the majority of NPIs are existentials (Haspelmath 1997; Israel 1997, 1998). Thus, universal quantifier NPIs like Dutch *hoeven*, (and also English *need*, and German *brauchen* 'need'; cf. Iatridou and Zeijlstra 2010, 2013; see also Homer 2011) can thus hardly be treated as bearing a σ -feature or exhibiting referential deficiency.

Here we already have preliminary evidence to accept the non-competitive relation among the three previous approaches. As we demonstrate in the remainder of this paper, acquisition can provide further evidence that these approaches are not competitive at all. Since each approach assumes a different property underlying NPI-hood, this will lead us to conclude that NPIs of different strengths have become NPIs due to completely different properties.

3 Methodology

To obtain an overview of acquisitional pathways of different NPIs, we executed an intensive search in the CHILDES database (MacWhinney 2009). In this research we investigated a total of 2940 CHAT files of spontaneous speech data of monolingual children between one and five years old. Section 3.1 briefly introduces the three NPIs that we examined in child languages. After that we zoom in at the subcorpora included in the

sensitive due to idiosyncrasy. As this paper only focuses on the acquisition of strong/weak, weak, and superweak NPIs, we do not discuss (super)strong NPIs further.

current research. Section 3.3 presents the procedure of categorizing the collected child data.

3.1 Selected NPIs

Three NPIs were selected as targets of investigation for the current research aim of determining to what extent the acquisitional patterns of different NPIs are distinct. They were Dutch modal verb *hoeven* 'need', English indefinite *any*, and Mandarin indefinite *shenme* 'a/some'. An important reason for such a selection is that these NPIs do not only differ from each other in types: *hoeven* is a modal verb, while *any* and *shenme* are indefinite; but they also differ in strengths: *hoeven* is strong/weak, *any* is weak, and *shenme* is superweak. This satisfied the crucial criterion for our hypothesis testing, since the question was whether NPIs of different strengths exhibit distinct acquisitional pathways.¹²

Moreover, our selection of the three NPIs had two additional methodological advantages. First, these NPIs are highly frequently attested in child languages, even at early stages when children are younger than three years old. This enabled us to attest the whole developmental trajectory of the three NPIs due to the sufficient amount of data from children of both younger and older ages. Second, the size of the subcorpora of Dutch, English, and Mandarin Chinese is sufficiently large. We were therefore able to collect statistically representative data, which led to statistically valid conclusions.

3.2 Selected corpora

The current corpus research investigated 2940 CHAT files in the CHILDES database (MacWhinney 2009). For the distribution of the Dutch NPI in child language, we examined spontaneous speech data of 59 monolingual children between one and five years old recorded in a total of 710 CHAT files in the following subcorpora: *BolKuiken* (Bol and Kuiken 1990),¹³ *CLPF* (Fikkert 1994; Levelt 1994), *Groningen* (Wijnen and Bol 1993), *Schaerlaekens* (Schaerlaekens 1973), *VanKampen* (Van Kampen 1994), and *Wijnen* (Elbers and Wijnen 1992; Wijnen 1988, 1992).

To examine the developmental pathway of the English NPI, we investigated a total of 1492 CHAT files containing spontaneous speech data of 145 monolingual children between one and five years old. The data were collected from the following British English corpora in CHILDES: *Belfast* (Henry 1995; Wilson and Henry 1998), *Cruttenden* (Cruttenden 1978), *Fletcher* (Crystal et al. 1989; Fletcher and Garman 1988; Karmiloff-Smith 1986), *Forrester* (Forrester 2002), *Howe* (Howe 1981), *Lara* (Rowland and

¹² See 2.1, 2.2, and 2.3 for an overview of the distribution of Dutch *hoeven*, English *any*, and Mandarin *shenme*, respectively.

¹³ Only typically developing children recorded in this subcorpus were included.

140 Acquiring Negative Polarity Items

Fletcher 2006), *Manchester* (Theakston et al. 2001), *Thomas-Heritage* (Lieven et al. 2009), and *Wells* (Wells 1981).

As for the acquisition of Mandarin *shenme*, three subcorpora in CHILDES were employed for data collection. They were *Beijing 2* (Tardif 1993, 1996), *Zhou 1* (Zhou 2004a), and *Zhou 2* (Zhou 2004b). These subcorpora provided a total of 734 CHAT files, covering spontaneous speech data of more than 40 monolingual Mandarin children aged between one and five.

Among the 59 Dutch children investigated, merely two of them were longitudinally recorded for the whole age range examined in the current research, namely Sarah and Laura in *VanKampen* (Van Kampen 1994). Out of the 145 English children studied in this paper, only 16 children were longitudinally recorded from approximately one and a half years old to before their fifth birthday – the participants in *Wells* (Wells 1981). As for the Mandarin children included in our research, no longitudinal data were even available. We therefore opted for a cross-sectional analysis of child data in each of the selected languages.

3.3 The procedure

The procedure of our corpus research is as follows. We first divided all children in each language into different groups depending on their age of recording, creating three age groups distinguished in the current study: Group 1 (one- and two-year-olds), Group 2 (three-year-olds), and Group 3 (four-year-olds).^{14,15} Afterwards, we counted the frequency of the target NPIs per age group in each language by employing the *freq-command* of the CLAN program in CLAN CHAT files. For the English and Mandarin NPIs, the target form searched in CHILDES was “any” and “什么” (*shenme* in characters), whereas for the modal verb NPI *hoeven* in Dutch, all its three inflected forms of the present tense plus its infinitive form were taken into consideration, namely *hoef* (HOEVEN-1SG), *hoeft* (HOEVEN-2/3SG), and *hoeven* (HOEVEN-PL/INF).

All utterances containing the target NPIs were then judged for their

¹⁴ The current study chose the chronological age at recording to benchmark children’s acquisitional stages. Another alternative would be the Mean Length of Utterance (MLU), in either morphemes or words. As far as we understand, however, MLU is mainly employed to distinguish atypically developing children from their typically developing counterparts (see, for instance, Bishop and Adam 1990; Nippold 1990; Nippold and Schwarz 2002) or to indicate language proficiency of children in early language development, i.e. before approximately three and a half years old (Leonard 2014; among others). Since all of our participants were typically developing children up to the age of five, we chose not to use MLU. Moreover, MLU is not a reliable indicator in cross-linguistic research due to its cross-linguistic variations.

¹⁵ We did not separate a distinct age group of children of one year old at the moment of recording, because those children rarely produce the target NPIs.

licensing status by using the *kwal-command*. Generally, three lines of context preceding and following an utterance containing the NPIs were analysed to evaluate the NPIs' licensing status, by adding "+w3" and "-w3" to the command. If a total of six lines of context were not sufficient, more contextual data were checked manually. Five categories regarding licensing status were distinguished in this respect: *licensed NPIs*, *unlicensed NPIs*, *self-correction*, *unclear situation*, and *others*.

Licensed NPIs refers to child utterances in which the target NPIs appeared under the scope of a proper licenser; the category of *unlicensed NPIs* covers utterances containing the NPIs in the absence of a proper licenser. If children substituted the target NPIs by other items after first uttering the NPIs, an instance of *self-correction* was counted. If it was impossible to analyse the licensing status of the NPIs after taking both linguistic environment and available contextual information into account, an instance of *unclear situation* was counted. Child utterances containing the NPIs that did not fall under the above-discussed categories were labelled as *others*. Examples of each category are provided in Appendix N.

Finally, the child utterances containing licensed NPIs were further categorised for their licensing environments. Here we adopted the classification of different types of negative contexts introduced in Section 1 (see also Figure 1 in Section 3). Because in child English and child Mandarin the investigated NPIs appeared systematically in polar questions and *wh*-questions, respectively, we added these two types of questions as licensing environments to better understand children's knowledge of the NPIs. Thus, the notions we employed for data categorisation are: Anti-Morphic contexts (AM), Anti-Additive but not Anti-Morphic contexts (non-AM, AA), Downward Entailing but not Anti-Additive contexts (non-AA, DE), polar questions, WH questions and other nonveridical contexts that are neither *wh*- nor polar questions (other NV).

4 Results

The frequency data of the target NPIs depending their licensing status are presented in the following figures. Figures 4 to 6 illustrate these results in child Dutch, child English, and child Mandarin, respectively.¹⁶ The raw data are provided in Appendix V.

¹⁶ As is well known, *any* can also function as a Free Choice Item (FCI). However, in order to compare the acquisition of *any* with the other two selected NPIs *hoeven* and *shenme*, which do not allow an FCI use, we chose to exclude the development of *any* as an FCI in child English. Therefore, Figure 5 only presents the results when *any* was attested as an NPI. Nonetheless, this does not imply that we assume two lexical *anys* in English, one as an NPI and the other as an FCI. To distinguish NPI-*any* from FCI-*any*, two diagnoses were employed: paraphrasing FCI-*any* by *whatever*

142 Acquiring Negative Polarity Items

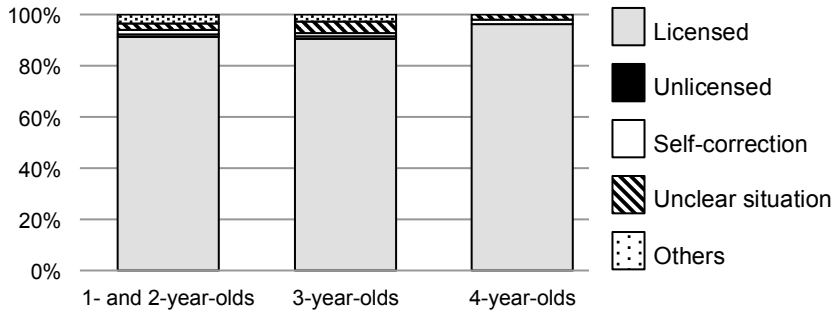


Figure 4: Distribution of *hoeven* depending on its licensing status in child Dutch

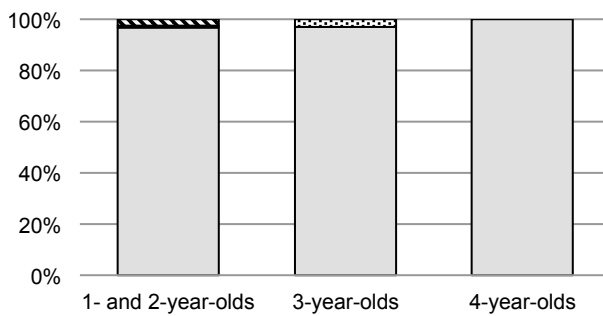


Figure 5: Distribution of *any* depending on its licensing status in child English

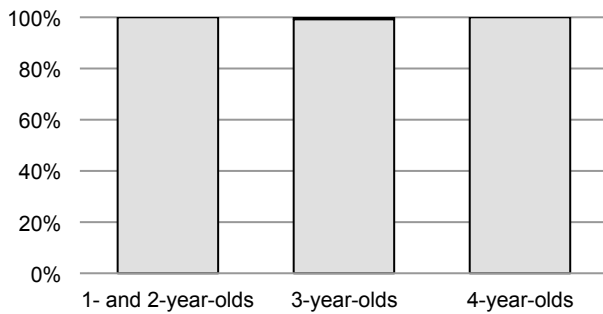


Figure 6: Distribution of *shenme* depending on its licensing status in child Mandarin

The bars in each graph stand for different age groups in child language development. The different shades and patterns in these bars represent the or *whichever* and substituting NPI-*any* with another weak NPI *ever*. We owe the second diagnosis to Laurence Horn (p.c.).

different licensing statuses of the NPIs uttered by children. For instance, the grey shade stands for *licensed NPIs* and the black shade refers to *unlicensed NPIs*. The data presented above clearly show that children of all languages are aware that these NPIs have a restricted distribution, even from the onset of language acquisition, as they virtually never produce unlicensed *hoeven*, *any*, or *shenme*. In particular, utterances containing unlicensed NPIs are rarely attested, namely less than 2% of the time in all age groups and languages. Now, the questions arise why children are already aware of the restricted distribution of these NPIs and where this awareness comes from? In order to address these questions (which we do in the next section), we first need to focus on the distribution of the NPIs in terms of their licensing environments. Our categorisation in this respect (see also 3.3) led to the following results. Again, the bars stand for the age groups distinguished in our study, but the shades/patterns in the following graphs represent the semantic environments in which the NPIs are attested. For the relevant raw data, see Appendix W.

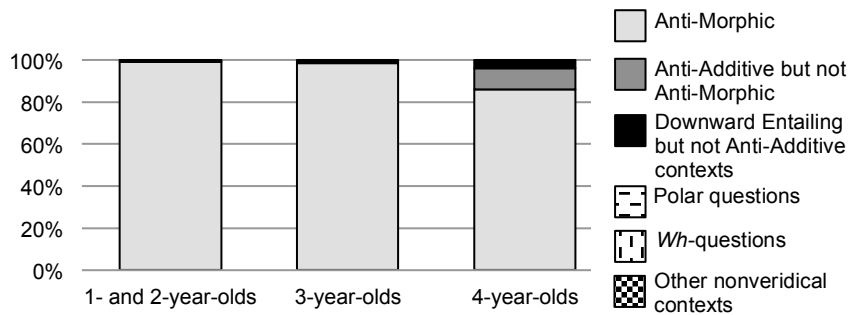


Figure 7: Distribution of *hoeven* depending on its licensing environment in child Dutch¹⁷

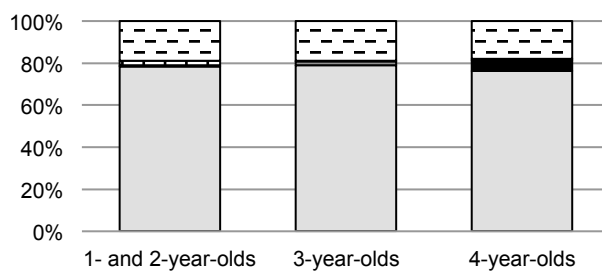


Figure 8: Distribution of *any* depending on its licensing environment in child English

¹⁷ We exclude five and four instances in Groups 1 and 2, respectively, because these instances contained pragmatically licensed *hoeven*, e.g. in contrastive contexts. We refer the reader to Lin et al. (2015) for a precise illustration of this licensing condition in early child Dutch.

144 Acquiring Negative Polarity Items

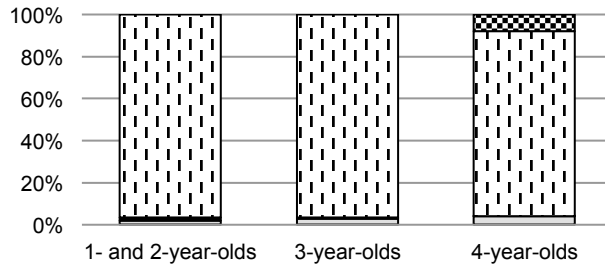


Figure 9: Distribution of *shenme* depending on its licensing environment in child Mandarin

Whereas the distribution of all the selected NPIs in different licensing environments does not significantly differ between Group 1 (one- and two-year-olds) and Group 2 (three-year-olds) ($p=.638$, $df=2$ in Dutch; $p=.311$, $df=3$ in English; and $p=.662$, $df=2$ in Mandarin), we find a significant difference between children younger than the age of four and their older counterparts ($p=.001$, $df=2$ in Dutch; $p=.000$, $df=4$ in English; and $p=.000$, $df=3$ in Mandarin).¹⁸ These differences are also illustrated in the graphs below.

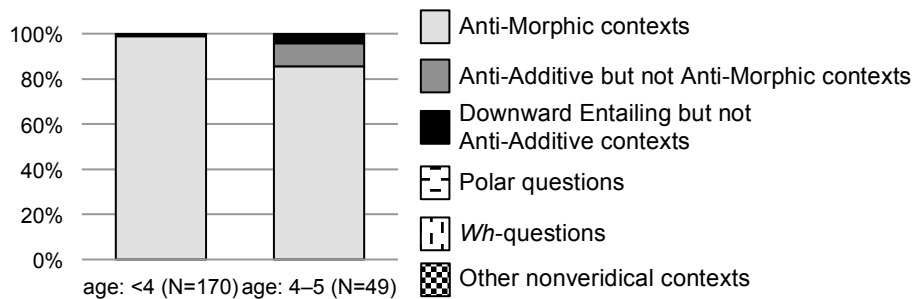


Figure 10: Distribution of *hoeven* in early and late child Dutch

¹⁸ We used Fisher's Exact Test to compare the distribution of the selected NPIs in different groups, under the assumption of no individual difference with respect to children's employment of the NPIs.

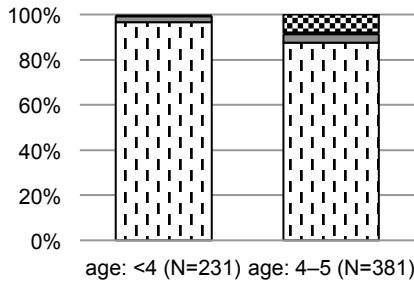


Figure 11: Distribution of *any* in early and late child English

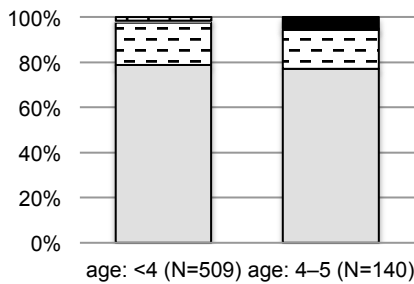


Figure 12: Distribution of *shenme* in early and late child Mandarin

The figures presented above present two similarities and one difference in the acquisition of NPIs of different strengths. One similarity is that the acquisition of all of these NPIs has two developmental stages, namely an early stage when the children are under the age of four and a late stage when the children are between four and five. Another similarity is that the acquisition of the NPIs all shows a widening learning path. In early child language, the NPIs are merely used in one or two semantic contexts, whereas at the subsequent stage, the NPIs are systematically used in more types of licensing contexts. This is evident when we compare the shaded/patterned areas in the two bars in each graph above. However, there is a crucial difference between the distribution of the three NPIs in child language, namely that the semantic contexts in which the NPIs are attested differ from NPI to NPI. We see this difference immediately when we compare the shade/pattern of the bars in one graph to those in another.

Figure 10 shows that younger Dutch children only use the sentential negation *niet* 'not' to license the NPI (at 98.9%), whereas their older counterparts also employ negative indefinites such as *niks* 'nothing' or *geen* 'no(ne)' as licensers for *hoeven* (at 10.2%). However, the developmental pathway of the NPI *any* is different in child English (see Figure 11). Although English children below four systematically use *not* to license the NPI (at 78.6%), similar to their Dutch counterparts, they also show evidence for

146 Acquiring Negative Polarity Items

polar questions in *any* licensing (at 18.86%).¹⁹ Older children, on the other hand, are capable of using more types of semantic contexts to license *any*. We find *any* licensed in various Downward Entailing contexts, which are neither introduced by *not* nor polar questions at around 5% in late child English. As for Mandarin *shenme*, its acquisitional pathway differs from both Dutch *hoeven* and English *any* (see Figure 12). In early child Mandarin, we virtually only attest *shenme* in *wh*-questions functioning as a *wh*-indefinite (at 96.5%). In late child Mandarin, however, we see that children are also able to use *shenme* in different nonveridical contexts that are not *wh*-interrogatives (at 13.2%).

The results presented above clearly reveal that the acquisition of the three NPis all exhibit two developmental stages. The next section will provide an explanation for each of the attested developmental patterns. As we will show, the NPis – irrespective of their types or strengths – are all acquired via the same learning mechanism, i.e. conservative widening. Nonetheless, we will present evidence for distinct acquisitional paths, leading to different analyses of the NPis in late child language.

5 Explaining the acquisitional pathways

This section argues that the three NPis are acquired via the same learning mechanism: a conservative widening learning strategy (introduced in Section 1). However, not all of the NPis show a widening acquisitional pathway alongside the hierarchy of negative expressions (see Figure 1 in Section 1). In fact, only the acquisition of *hoeven* seems to follow the widening pattern: children start to use *hoeven* in Anti-Morphic contexts only but also employ Anti-Additive contexts that are not Anti-Morphic to license the NPI later on. Thus, although the same learning hypothesis is responsible for the acquisition, we present evidence that the acquisitional pathway differs from NPI to NPI. This gives rise to distinct adult analyses of the NPis, leading to the conclusion that NPis of different strengths are NPis due to different reasons.

5.1 The same learning strategy

The acquisition of the selected NPis all turn out to have two developmental stages. Moreover, we find evidence that for all three NPis, children at the late stage employ significantly more types of licensing contexts to license the NPis compared to their younger counterparts. We explain such

¹⁹ A similar distributional pattern of the NPI *any* in early child English was also reported in Tieu (2010), in which speech data of three monolingual American English children aged between approximately one and five years old in the CHILDES database were analysed: Adam (*Brown*; 2;03.04–5;01.12), Naomi (*Sachs*; 1;02.29–4;09.03), and Nina (*Suppes*; 1;11.16–3;03.21).

developmental patterns from small to larger sets of licensing environments for the NPIs as a consequence of the conservative widening learning strategy, which predicts a learning path from narrow to wider generalisations (see Section 1). If narrow generalisations give rise to small sets of licensing contexts for the NPIs, then it naturally follows that whenever children extend their narrow generalisations to wider analyses, they consequently produce larger sets of licensing environments for the NPIs.²⁰ This brings us to the conclusion that children acquire NPIs via conservative widening – irrespective of their NPI strengths.

In what follows, we present two more pieces of evidence for the same learning strategy in the acquisition of the different NPIs. Since this requires a deeper understanding of conservative widening, we first introduce this learning strategy in greater detail.

Conservative widening is best defined in terms of the subset principle (Manzini and Wexler 1987), as this principle “demands that a learning procedure should guess the narrowest possible language, consistent with positive evidence seen so far” (Berwick and Weinberg 1986: 233). Under the hypothesis of conservative widening, two generalisations for acquisition are derived. The first is that a reanalysis at a certain stage is always less strict compared to an analysis established at a preceding stage. In turn, the set of outcomes generated by a strict analysis always forms a subset of the set of outcomes generated by a less strict reanalysis.

Furthermore, conservative widening predicts that language acquisition has various developmental stages. Language learners start with the strictest possible analysis of their target language based on limited input evidence that is available in the acquisitional onset. Although an initial analysis established in this way may not always be identical to the adult analysis of the target language, it is at least compatible with all input data provided or analysed thus far. Nonetheless, a strict initial analysis can easily be falsified by “new” input data that children are confronted with or able to process at subsequent stage. In order to solve this problem, language learners are expected to weaken their strict initial analysis to establish a less strict reanalysis by taking both the “old” and “new” input evidence into consideration. Such a process of adjusting the analysis of the target language against the seen or processed input evidence continues until at certain stage of language acquisition, learners develop an analysis that explains all input data received or analysed throughout the whole process of language development.

Now we present the other two pieces of evidence for conservative widening in the acquisition of the NPIs of different strengths. A closer look at

²⁰ The larger sets of licensing environments are constrained by children’s lexical knowledge of different licensors for the NPIs. Take English *any*, for example. Before children extend the licensing environments for *any* from in the scope of *not* or in polar questions to different Downward Entailing contexts, it is crucial that they have learnt how these contexts are linguistically represented in their target language.

148 Acquiring Negative Polarity Items

Figures 7 to 9 reveals that the percentage of the category of *unlicensed* is extremely low or even zero, regardless of the age group or language (see also Appendix W). This means that children in all age groups almost never overuse the NPIs in non-licensing environments. The absence of such overgeneralisation errors provides evidence for conservative widening, because “[b]y hypothesizing as narrow a target language as possible, the acquisition procedure is protected from disastrous overgeneralization” (Berwick and Weinberg 1986: 233).²¹

A second piece of evidence for conservative widening in NPI acquisition concerns the distribution of NPIs in early child language: Dutch *hoeven* in the scope of the sentential negation *niet*, English *any* in the scope of *not* or in polar questions, and Mandarin *shenme* in *wh*-interrogatives. Our investigation of the distribution of these NPIs in child-directed speech shows that all the licensing environments attested in early child language are also the most frequently used licensing conditions for the three NPIs in the input.²² In particular, *niet* licenses *hoeven* in child-directed Dutch more than

²¹ As acknowledged in the literature, the existence of NPIs raises a learnability problem for language acquiring children (Lin et al. 2015; Tieu 2013; Van der Wal 1996; among others), since the absence of a form X in the language input does not necessarily indicate its ungrammaticality according to the adult grammar. Thus, based on the absence of X in the input, language learners can hardly acquire the target grammar and are therefore expected to make overgeneralisation errors during their acquisitional trajectory. Unlearning overgeneralisation errors would require the child to be systematically confronted with *direct negative evidence*, i.e. corrective feedback from parents or an explicit denial of a child’s ungrammatical utterance (Baker and McCarthy 1981; Marcus 1993; among others). However, such evidence has been argued to have little effect on language acquisition (Baker and McCarthy 1981; Berwick 1985; Braine 1971; Grimshaw 1981; Manzini and Wexler 1987; Pinker 1984, 1995, 2013; among others). The child therefore needs to employ a learning mechanism that prevents children from making overgeneralisation errors in the first place. We refer the reader to Lin et al. (2015), in which the authors discuss this issue in greater detail.

²² For the distribution of the NPIs in child-directed speech, we analysed data (randomly) collected from the following subcorpora of the CHILDES database (MacWhinney 2009): *BolKuiken* (Bol and Kuiken 1990), *Groningen* (Wijnen and Bol 1993), *VanKampen* (Van Kampen 1994), and *Wijnen* (Elbers and Wijnen 1992; Wijnen 1988, 1992) for Dutch *hoeven*; *Belfast* (Henry 1995; Wilson and Henry 1998), *Cruttenden* (Cruttenden 1978), *Fletcher* (Crystal et al. 1989; Fletcher and Garman 1988; Karmiloff-Smith 1986), *Forrester* (Forrester 2002), *Howe* (Howe 1981), *Lara* (Rowland and Fletcher 2006), *Manchester* (Theakston et al. 2001), *Thomas-Heritage* (Lieven et al. 2009), and *Wells* (Wells 1981) for English *any*; *Beijing 2* (Tardif 1993, 1996), *Zhou 1* (Zhou 2004a), and *Zhou 2* (Zhou 2004b) for Mandarin *shenme*. These data are presented in Appendix 2.

80% of the time; *not* and polar questions license *any* at approximately 90% in the input (*not* at 57.6% and polar questions at 32.3%); and *shenme* is used as a question word in *wh*-interrogatives at 97.7% in child-directed Mandarin. These input results together with the acquisitional data confirm that the most frequently attested licensers in the input are also the first licensers acquired by the children. This is exactly what we expect from conservative widening, which hypothesises children to make their first attempt based on input evidence only. Since the input evidence is limited in the onset – due to either the narrow amount of data presented to the child or the child’s restricted ability to process or analyse the data – distributional properties such as frequency become crucial to the first steps in acquiring the NPIs.

5.2 Distinct acquisitional pathways

Under the conservative widening learning hypothesis, each developmental stage corresponds to a unique analysis of the target language. Given that the acquisition of each NPI displays (at least) two distinct developmental stages, we argue that children first come up with a particular initial *analysis* for some NPI and *reanalyse* this at later stage. However, as the widening patterns in terms of the types of licensing environments differ from NPI to NPI, we assume that each NPI investigated has its own analysis and reanalysis. The remainder of this subsection explains the analysis and reanalysis for each NPI. Since the initial analyses are input-based only, we start our explanation by examining the distribution of the NPIs in child-directed speech.

5.2.1 Dutch *hoeven*: from [HOEVEN NIET] to [HOEVEN NEG]

In the acquisition of the Dutch NPI, we find that children at the initial stage only use *hoeven* in the scope of *niet*, whereas in the subsequent stage they also use the NPI in the scope of negative indefinites such as *niks* ‘nothing’ or *geen* ‘no(ne)’ (cf. Figure 10). In child-directed Dutch, *hoeven* is licensed in the scope of the sentential negation *niet* more than 80% of the time.²³ Given the massive co-occurrence of the NPI and negation, we assume that children at the initial stage of acquisition take *hoeven* to always co-occur with *niet* and as such to store these items as one single lexical frame [HOEVEN NIET] (cf. Lin et al. 2015).

The lexical frame of [HOEVEN NIET] as the analysis of the Dutch NPI can only generate *hoeven*’s appearance under the scope of the negative marker *niet*. This explains why *niet* is virtually the only licenser for the NPI attested in early child Dutch. However, as there is still 20% of the input data that cannot be captured by [HOEVEN NIET], Dutch children are expected to

²³ Among these utterances, the percentage of co-occurrences of *hoeven* and *niet* with a distance between zero (i.e. adjacent co-occurrence) and three syllables reaches 97.32%. Hence, *niet* is not only the most frequent licenser in child-directed speech, but it is also (nearly) adjacent to *hoeven*. See also Lin et al. (2015) for a related discussion.

150 Acquiring Negative Polarity Items

make a reanalysis when they are able to process and analyse more input data. Of the remaining 20% of the language input, *hoeven* is licensed by negative indefinites more than 15% of the time (see Appendix O). Thus, reanalysis by older children must generate *hoeven*'s appearance in the scope of not only *niet* but also negative indefinites such as *geen* or *niks*. What is the reanalysis then?

Given the decompositional analysis of negative quantifiers in Germanic languages as introduced in Section 2.1 (after Jacobs 1980), we propose that in late child Dutch, *hoeven* is lexically associated with the abstract negation NEG that all negative indefinites, among others, are composed of. We represent such a reanalysis of *hoeven* as [HOEVEN NEG]. The abstract negation NEG can be phonologically realised by the specific negative marker *niet*, resulting in licensing of *hoeven* by the negative marker; it can also be spelled out as the negation incorporated in negative indefinites, leading to *hoeven*'s occurrence under the scope of negative indefinites. This explains why negative indefinites are attested as *hoeven*-licensors in addition to *niet* in late child language.

The analysis as [HOEVEN NIET] generates *hoeven*'s appearance in Anti-Morphic contexts only, which is in the scope of *niet*. The reanalysis as [HOEVEN NEG] allows *hoeven* to appear in a wider set of negative contexts, and that is all Anti-Additive contexts. Apparently, this widening pathway from Anti-Morphic to all Anti-Additive contexts follows the acquisitional pathway of NPIs motivated in Van der Wal (cf. Section 1). However, our explanation for this learning path differs from hers. For us, the observed widening pattern of *hoeven* in child Dutch development reflects a reanalysing process during the acquisition: from the lexical frame as [HOEVEN NIET] to the abstract analysis as [HOEVEN NEG]. For Van der Wal, on the other hand, this developmental path reflects instead the order in which the acquisition of different negative expressions in Dutch takes place. We refer the reader to Lin et al. (2015) for a more detailed discussion in this respect.

Under the hypothesis of conservative widening, we explained the widening pattern observed for the Dutch NPI *hoeven*. They start with a narrow assumption that *hoeven* is lexically associated with *niet* as [HOEVEN NIET] and switch to a more abstract reanalysis of *hoeven* bearing a lexical association with an abstract negation NEG as [HOEVEN NEG]. Both the analysis and the reanalysis are triggered by input evidence. Our explanation also shows that linguistic knowledge about the syntactic structure of negative indefinites in Dutch is crucial to establish the reanalysis as [HOEVEN NEG]. Lin et al. (2015) report that Dutch children younger than four already show evidence for their acquisition of the decomposable structure of negative indefinites seen in Figure 2. This means that before children make the reanalysis as [HOEVEN NEG], they have already acquired the syntactic structure of negative indefinites as containing NEG on the one hand and an existential quantifier on the other. This supports the hypothesised reanalysing process from [HOEVEN NIET] to [HOEVEN NEG].

The reanalysis as [HOEVEN NEG] shows exactly how adult Dutch speakers analyse the NPI, since NEG can be spelled out as *niet*, or the

negation incorporated in the set of NEG-DE contexts as discussed already in 2.1. This means that Dutch children do not need to further analyse *hoeven* after they have established the abstract analysis as [HOEVEN NEG] – even when they are confronted with or able to process more input data containing *hoeven* appearing in different NEG-DE contexts. Thus, [HOEVEN NEG], emerged in late child Dutch, is the adult analysis of the strong/weak NPI. Such an analysis of NPIs provides evidence for Postal's approach to NPI-hood (2000): NPIs carry a negation NEG in their underlying representation (see Section 2.1). The acquisitional pathway observed for *hoeven* leads us to the conclusion that *hoeven* is a Postal-type NPI (see also Lin et al. 2015).

5.2.2 English *any*: from bearing an immediate scopal relation with \neg to bearing $[\sigma]$

As presented in Figure 11, English children use two kinds of licensing environments to license *any* at the early stage: in the scope of the sentential negation *not* at 78.6% and in polar questions at 18.86%. At the subsequent stage, children start to use a variety of Downward Entailing contexts that are not introduced by *not* to license the NPI as well, just like conditional clauses, the restrictive clause of universals. Under the hypothesis of conservative widening, this subsection provides an explanation for such a developmental path. Again we start by investigating the distribution of the NPI in child-directed English.

We see that in language input, *any* appears in the scope of *not* at 57.6% and in polar questions at 32.3% (see Appendix P). We assume that *any*'s overwhelming appearance in these two contexts triggers children's initial analysis of the NPI.²⁴ In order to explore children's initial analysis of the NPI, however, we need to understand more about the semantics of polar questions; in particular, what exactly polar questions containing *any* represent according to early child grammar.

At closer inspection, it turns out that in early child English *any* is not attested in all kinds of polar questions but almost always in those with a negative bias. We therefore assume that polar questions containing *any* always exhibit a negative bias in early child grammar.²⁵ There is evidence for this assumption. We find that at least 80.5% of the polar questions

²⁴ Nothing prevents us from presuming that children have two separate grammars of the NPI as proposed in Tieu (2010), following Guerzoni and Sharvit's distinct analysis of *any* (2007). Nevertheless, we prefer a unified analysis that explains *any*'s distribution in the scope of both *not* and polar questions, especially since such a unified analysis is possible.

²⁵ The literature thus far does not agree on whether the appearance of *any* in polar questions always triggers a negative bias in the adult grammar. However, this is not crucial to the current research aim. Instead, what is crucial here is whether the younger children interpret and use polar questions containing *any* as having a negative bias. We therefore only focus on the appearance of *any* in polar questions in early child English and the interpretation thereof.

152 Acquiring Negative Polarity Items

containing *any* uttered by children younger than four convey a negative bias: 15.5% exhibit a negative bias indicated by the child her/himself, while 65% are responded to with either a negative answer (direct or indirect) or a positive answer with counterevidence – two kinds of felicitous responses to negatively biased polar questions (Krifka 1995; Van Rooij 2003). If the polar questions containing *any* in early child language were neutral, we would expect a chance-probability of the parents or the investigators giving either a positive or a negative answer to such questions, which should be both around 50%. Although the remaining 19.5% of the polar questions containing *any* uttered by younger children are not categorised as having a negative bias, we only have contextual information for 5.7% of these questions, i.e. five utterances, for which a positive expectation by the child can be derived. The relevant data are presented in Appendix R.

However, their counterparts without the NPI do not tend to convey such a bias at all. An investigation of 103 polar questions without *any* randomly selected in early child English shows that in only 25.2% of the cases can such questions be analysed as having a negative bias. This leads us to conclude that polar questions containing *any* express a negative bias in early child language.²⁶ This also suggests that polar questions without the NPI actually express a positive bias in early child English, which means that early child grammar only associates polar questions containing *any* with some kind of negative meaning. The relevant data are presented in Appendix S.

Following Asher and Reese (2005), we analyse polar questions with a negative bias as containing two parts: a negative assertion $\neg p$ and a question that questions that negative assertion, representing $\{\neg p, \neg\neg p\}$,

²⁶ A critical reader may have the following question: where does the negative bias of polar questions containing *any* come from in early child grammar? We do not have an explicit answer or a detailed proposal here. However, we assume that the emergence of the negative bias in polar questions containing the NPI is triggered by an interesting characteristic of the input data directed towards English children under the age of four. We find that about one in every five negative statements containing *any* in the scope of the sentential negation *not* in the input, i.e. 78 out of 408, is marked by a positive tag question as shown below. The ages given in the examples below indicate the ages of the children towards which the utterances were addressed.

- (i) You don't like *any* fruit, do you? (2;01.23)
(Theakston et al. 2001: joel09b.cha: line 1598)
- (ii) You are not making *any* effort to eat them, are you? (2;02.04)
(Lieven et al. 2009: 2-02-04.cha: line 2961)

Tag questions have a reduced form of generic polar questions. However, due to the preceding negative statement, positive tag questions are not analysed as generic or neutral polar questions but as a pragmatic tool to emphasize the preceding negative statement, inducing a negative meaning (Van Rooij and Šafářová 2003; among others).

following the semantics of polar questions proposed in Hamblin (1973), and Groenedijk and Stokhof (1984).²⁷ Following this analysis, we see that each part of a negatively biased polar question contains a sentential negation. Thus, in polar questions with a negative bias, *any* always stays in the scope of a sentential negation, just like *any* appearing in negative clauses introduced by *not*.

If polar questions containing *any* always express a negative bias in early child grammar, it is natural to hypothesise that the initial analysis of the NPI is that it must always appear in the immediate scope of a sentential negation, which is realised either as *not* in a canonical negative sentence or as a logic negation in a negatively biased polar question. The initial analysis as such explains why in early child language, *any* appears 97.7% of the time in the direct scope of *not* or in polar questions. Moreover, this initial analysis also accounts for why *any* is not attested in the scope of Anti-Additive elements that are not Anti-Morphic in early child English, such as *no* and *nobody*, although children at the early stage are already able to use such negative quantifiers systematically in their spontaneous speech (see Appendix U); in these contexts, *any* no longer lies in the immediate scope of a sentential negation, as the existential quantifier would take scope in between the two.

Although the children's initial analysis of *any* only allows the NPI to appear in the immediate scope of a sentential negation, the employment of *any* in this environment is not the only option in early child English. As indicated by the child utterances below, besides *any* (as in (24a)), bare NPs (as in (24b)) and NPs modified by a plain indefinite (as in (24c)) are also good alternatives to modify an NP in negative clauses introduced by *not* in early child language. The relevant NPs are marked in italics.

- (24) a. Horsey didn't eat *any grass*. (2;09.14)
 (Lieven et al. 2009: 2-09-14.125.cha: line 1488)
- b. I don't want *bubbles*. (2;10.18)
 (Theakston et al. 2001: liz34b.cha: line 682)
- c. I can't see *a banana*. (3;00.08)
 (Rowland and Fletcher 2006: 3-00-06.80.cha: line 119)

²⁷ Other approaches to negatively biased polar questions are Guerzoni (2003) and Van Rooij (2003). From a syntactic perspective, Guerzoni argues that polar questions with a negative bias are negative assertions, i.e. $\neg p$, rather than questions. Van Rooij, however, analyses negatively biased polar questions as true questions denoting $\{p, \neg p\}$ but differing from their neutral counterparts in that they necessarily carry a strong negative presupposition or implicature. It is not our goal to participate in the debate on the semantics and/or pragmatics of polar questions with a negative bias. We therefore refer the reader to Asher and Reese (2005) and the references therein for a related discussion.

154 Acquiring Negative Polarity Items

This pattern is far from unfamiliar in adult language. What determines whether *any* is used in the environments where *any* can be used? Kadmon and Landman (1993) already address the semantic difference between using an *any*-NP and an *a/an/∅*-NP in utterances such as (24) and show based on this pattern that *any* is a domain widener whereas *a/an/∅* is not. On the basis of these distinctions in the adult usage of *any*, we suggest that the pattern in (24) observed in early child language does not manifest itself at random. We further assume that children (at some point) acquire that *any* is not a plain indefinite that must stay in the immediate scope of a sentential negation but rather a domain-widening indefinite that bears that scopal restriction with respect to \neg .

Now, the children's initial analysis that *any* must always stay in the immediate scope of the sentential negation can only explain approximately 90% of the input evidence. Therefore, children are expected to reanalyse the NPI when they are confronted with or become capable of analysing more input data that may falsify their initial assumption of the NPI. In the remaining 10% of the input data, we found that approximately 9.7% contains *any* licensed in different Downward Entailing contexts that are not introduced by *not*, just like conditional clauses, the restrictive clause of universals (see again Appendix P). Obviously, such input evidence falsifies children's initial analysis that *any* must appear in the immediate scope of a sentential negation. In particular, these falsifying input data trigger children to establish a reanalysis of the NPI that explains its restricted appearance to a variety of Downward Entailing contexts as a domain widener.

Domain wideners such as *any* automatically activate the largest domain associated or inferred by the discourse context and introduce subdomains as their alternatives (cf. Chierchia 2004, 2006, 2013). Moreover, domain-widening *any* is always stronger than any of its DAs under negation (Kadmon and Landman 1993; Krifka 1995; Chierchia 2004, 2006, 2013). This could then form a trigger for the children that *any* must always be exhaustified instead of appearing in the immediate scope of a sentential negation as assumed at the initial stage. We therefore assume an abstract exhaustification operator to apply to every (Downward Entailing) utterance containing *any* in the language input. To make the application of the exhaustification operator to the utterances containing *any* obligatory in late child grammar, we follow Chierchia (2004, 2006, 2013) to hypothesise that children reanalyse *any* as bearing a σ -feature that requires feature checking by the exhaustification operator via the syntax.

We summarise the hypothesised acquisitional process of the English NPI as follows. Children start with the analysis that *any* bears an immediate scopal relation with the sentential negation based on input evidence, which triggers the knowledge of *any* as a domain widener in child grammar. At the subsequent stage, when children are confronted with or able to analyse more input evidence that falsifies their initial assumption of the NPI, children reanalyse *any* as carrying a σ -feature itself, which triggers the presence of a covert exhaustifier *O*. The widening pathway from *any*'s appearance in *not*-

sentences or polar questions with a negative bias in early child language to its appearance in a variety of Downward Entailing contexts plus polar questions later on is clearly not identical to Van der Wal's proposed learning path along the negative hierarchy as exemplified in Figure 1.²⁸ Nonetheless, since the acquisition of *any* exhibits an extension from narrow to wide generalisations, it is still in agreement with the subset principle.

In the acquisition of the English NPI, input evidence plays an important role as it triggers both the analysis and the reanalysis. Moreover, children's knowledge on DEness turns out to be crucial in understanding the learning path of *any* as well. After all, without the knowledge on Downward Entailing environments and their interplay with exhaustification, English children would not be able to establish the reanalysis of *any* bearing a σ -feature that gives rise to a semantic contradiction in non-DE environments. As is reported in the literature, children younger than the age of four are already able to correctly distinguish DE from non-DE relations (see Crain and Thornton 2006 for a summary). This provides independent evidence for children's reanalysis of *any* at the late stage.

As is already illustrated in 2.2, the obligatory feature checking of *any*'s [σ] generates a restricted distribution of the domain widener to various Downward Entailing contexts, and obligatory exhaustive contexts such as polar questions (Guerzoni and Sharvit 2007; see also Nicolae 2013). This explains the absence of *any* in contexts that are not Downward Entailing or polar questions in late child English (see again Figure 11). More importantly, as the distributional pattern generated by *any*'s σ -feature is exactly what we observe in child-directed English (see Appendix P), children do not need to further update their reanalysis of the NPI. Hence, the reanalysis that *any* carries a σ -feature, which emerges at the late stage, signifies exactly how adult speakers analyse the NPI.

5.2.3 Mandarin *shenme*: from *wh*-indefinite to non-referential indefinite

Figure 12 shows the acquisitional pathway of the Mandarin NPI. In early child Mandarin, *shenme* is only used as a *wh*-word in *wh*-interrogatives, whereas at the late stage, children also utter *shenme* in different nonveridical contexts (including *wh*-interrogatives) that are not Downward Entailing. We find that in child-directed Mandarin, *shenme* is used as a

²⁸ Although in both early and late child English, *any* is systematically attested in polar questions, the reason underlying *any*'s appearance in such environments differs depending on the developmental stages. Polar questions license *any* in early child English because children take such licensing environments as another way of expressing a negative statement containing the sentential negation *not*; whereas polar questions license *any* in late child English because polar questions that are always interpreted exhaustively (Guerzoni and Sharvit 2007) containing a covert *only* (Nicolae 2013) that licenses σ -bearing *any* without giving rise to a semantic contradiction (Chierchia 2004, 2006, 2013).

156 Acquiring Negative Polarity Items

question word 97.7% of the time (see Appendix Q). Given the overwhelming occurrence of *shenme* in *wh*-interrogatives with a *wh*-interpretation, we take the children's initial analysis of the NPI is that *shenme* to be a *wh*-indefinite.

The analysis of *shenme* as a *wh*-indefinite is very strict, as it generates *shenme*'s appearance in *wh*-interrogatives only. This is exactly what we observe for this NPI in early child speech. More importantly, this initial *wh*-analysis is compatible with 97.7% of the input evidence. However, there is still 2.3% of the language input that cannot be explained by the *wh*-analysis of *shenme*, as it contains *shenme* in non-*wh* environments. In particular, in the remaining input data, *shenme* is used in a number of nonveridical contexts that are neither Downward Entailing nor *wh*-questions, such as epistemic modal contexts or imperfectives. When children are confronted with or able to analyse such input evidence, they are required to update their initial analysis of *shenme* to explain both the 97.7% "old" data portion and the 2.3% that is "new" data. To explore the reanalysis of *shenme* by children at the late stage, we must know more about the semantic property shared by *wh*-interrogatives and non-*wh*, nonveridical contexts.

According to Giannakidou (1997, 1998), questions including both polar questions and *wh*-interrogatives are nonveridical, as they cannot entail the truth of an embedded proposition. Thus, what is shared by *wh*-interrogatives and non-*wh* nonveridical contexts is that they both cannot entail the truth of an embedded proposition. Following Giannakidou (2011), only dependent variables that cannot introduce or refer to a discourse referent must appear in such contexts. This is because only nonveridical contexts (both *wh*- and non-*wh* ones) do not necessarily require the existence of a discourse referent. We therefore hypothesise that *shenme* is reanalysed as an NPI that contains a dependent variable at the late stage. Since NPIs of this type inherently cannot refer, due to their lexical deficiency, we further hypothesise that *shenme* is a non-referential indefinite in late child Mandarin.

The two stages observed in the acquisition of the Mandarin NPI are thus summarised as follows. At the first stage, children establish the analysis of *shenme* being a *wh*-indefinite; at the second stage, children come up with the reanalysis that *shenme* is a non-referential indefinite. Input evidence plays a crucial role in triggering both the analysis and the reanalysis. Moreover, two kinds of linguistic knowledge turn out to be important in establishing *shenme*'s reanalysis.

First, children are required to have the knowledge that *shenme* is a dependent variable that cannot introduce a discourse referent. Without the categorisation of *shenme* as a dependent variable, Mandarin children would not be able to come to the reanalysis of *shenme* being a non-referential NPI, as only dependent variables can be non-referential. The categorisation of *shenme* as a dependent variable is automatically made when children make their first step in acquisition to take *shenme* as a *wh*-word. This is because *wh*-words are dependent variables, as they need to be bound and licensed

by Q operators (see also Lin and Giannakidou Submitted).²⁹ Thus, the reanalysis process in acquisition is considered a modifying process based on input evidence within the same category of dependent variables, in particular, from *wh*-words to non-referential indefinites.

Second, children are required to have acquired nonveridicality before they can obtain any insight into the interplay between nonveridicality and non-referentiality to establish *shenme*'s non-referentiality. As far as we are concerned, we know of no research on the acquisition of (non)veridicality. Given that nonveridicality is defined in relation to a set of worlds epistemically accessible to the speaker (cf. Giannakidou), however, we assume that nonveridicality may represent the possibility of talking about different possible worlds including the actual one. We can therefore consider the development of Theory of Mind (ToM) as evidence for children's knowledge on (non)veridicality.³⁰

The literature thus far varies on the age of the acquisition of ToM – mainly depending on the tasks employed to assess children's development of ToM. Generally speaking, however, we have evidence for the acquisition of the basis of ToM as early as three years old, such as the difference between *know* (veridical knowledge) and *plan* (nonveridical intension) as well as the difference between *explanation* for veridical past and *prediction* for nonveridical future (Leekam 1993; Wellman and Estes 1986; Wellman and Woolley 1990; among others). Such evidence from the development of ToM suggests that three-year-olds might have acquired (non)veridicality such that they know that nonveridical contexts do not require (or presuppose) the existence of any discourse referent. This supports the hypothesised learning process of *shenme* from a *wh*-indefinite to a non-referential indefinite in child Mandarin.

The analysis of *shenme* as a question word generates a distributional pattern of *shenme* in *wh*-interrogatives only. This is exactly what we observe for early child Mandarin. The reanalysis of *shenme* as a non-referential indefinite generates *shenme* in a broader set of contexts than *wh*-interrogatives only, i.e. all nonveridical contexts. We therefore see that

²⁹ We assume that when a child utters a *wh*-interrogative, s/he shares the same semantic analysis of a question word that is involved as their parents. For example, a child is assumed to analyse *what* as a dependent variable that cannot be assigned a fixed value in the discourse but introduces a set of possible edible things when s/he utters: "What did mama eat?" We do not see otherwise how the communication between parents and children, for instance, could proceed or be successful.

³⁰ Theory of Mind is a psychological term, referring to the ability to attribute mental states to oneself and those to others to understand that others may have different beliefs, intensions, desires, knowledge, etc. (Hala and Carpendale 1997; Premack and Woodruff 1978). In terms of natural language semantics, ToM can be defined as the ability to distinguish the actual world, i.e. veridicality, from multiple non-actual but possible worlds, i.e. nonveridicality.

158 Acquiring Negative Polarity Items

children start to use *shenme* in a variety of nonveridical contexts after they acquire *shenme*'s non-referentiality. This learning process obeys conservative widening as it involves an extension from narrow to wider generalisations. Moreover, *shenme*'s distribution extends from *wh*-interrogatives only at the early stage to various nonveridical contexts later on, but not from Anti-Morphic to weaker negative expressions alongside the negative hierarchy as presumed by Van der Wal.

The learning path presented here clearly shows that Mandarin children acquire the non-referentiality of *shenme* via a *wh*-meaning. The transition from *wh*-words to non-referential NPIs in acquisition provides evidence for Giannakidou's treatment of superweak NPIs (1998, 2002, 2010, 2011), which explains NPI-hood as a consequence of referential deficiency. The reanalysis of *shenme* as a non-referential indefinite emerged at the late stage is already the adult analysis of the superweak NPI, as in adult Mandarin *shenme* appears virtually always in nonveridical contexts (Lin et al. 2014; see also 2.3). This means that *shenme* has become an NPI for the same reason as is proposed for its counterparts in Greek (Giannakidou 1997, 1998, 2001) and Korean (Giannakidou and Yoon 2011): referential deficiency.

6 Conclusion: Different properties underlying NPI-hood

By studying the acquisition of three NPIs of different strengths, namely strong/weak NPI *hoeven*, weak NPI *any*, and superweak NPI *shenme*, we explored the properties that may underlie NPI-hood put forth by three main approaches to the *licensee* question proposed in the literature. These are Postal's syntactic approach, which assumes an abstract negation NEG in the underlying lexical representation of NPIs as [NEG NPI]; Chierchia's syntactico-semantic approach, which explains the restricted distribution of NPIs to Downward Entailing contexts and obligatory exhaustive contexts such as polar questions as a result of their σ -feature and the fact that they obligatorily introduce domain alternatives; and Giannakidou's pragmatic/semantic approach that takes NPIs' polarity sensitivity as a result of their lexical referential deficiency. In Section 2 we already showed that these three approaches may not be competitive, as they can give rise to different sets of licensing environments of NPIs – creating NPIs of different strengths (cf. Table 1). Our investigation of the acquisition of the three NPIs in Sections 3 to 5 led us to conclude that NPIs of different strengths have indeed become NPIs due to completely different reasons.

The conclusion of different properties underlying NPI-hood is essentially supported by the fact that we did not find a universal learning path that started with Anti-Morphic contexts as licensers for NPIs and extended to weaker negative contexts as NPI-licensers alongside the hierarchy of negative expressions (cf. Van der Wal; see again Section 1). Although the developmental pathway of *hoeven* might have appeared to be

identical to Van der Wal's predicted path, it was not; the acquisitional path of *any* and *shenme* is actually different from what was presumed by Van der Wal. If it were one and the same property that underlies NPI-hood for all NPIs, it would be highly likely that this property (being NEG, [σ] or non-referentiality) would exhibit a same pathway in child language development.

However, distinct learning pathways in the acquisition does not exclude that all NPIs are still acquired via a more general universal learning mechanism. The three developmental paths can all be described in terms of the subset principle, as they all represent a learning process in which children first learn narrow generalisations and then widen these according to language input. We therefore conclude that NPIs of different strengths are acquired via the same learning strategy: conservative widening (Berwick and Weinberg 1984; Manzini and Wexler 1987).

Under conservative widening, the initial analyses of the NPIs are explained based on input evidence alone; but as we showed in 5.2, it is the combination of both input evidence and some linguistic knowledge that determines the analyses of the NPIs arising at the late developmental stages. These analyses in turn represent different reasons for which the investigated NPIs of different strengths have become polarity sensitive. Since input evidence is language specific, which means that the different NPIs exhibit idiosyncratic distributional patterns in child-directed speech, the linguistic knowledge required to analyse the idiosyncratic input evidence also varies: for Dutch *hoeven*, it is the syntactic knowledge of negative indefinites; for English *any*, it is the semantic knowledge to distinguish DE from non-DE relations; and for Mandarin *shenme*, it is the pragmatic knowledge concerning multiple possible worlds. Obviously, the components (input evidence and the required linguistic knowledge), on which the reanalyses of the NPIs are based, differ from NPI to NPI. Different approaches to the NPIs emerged in late child language become a natural result.

Turning back to the discussion of the existence of *the class of NPIs* as a grammatical category, our acquisitional data provide counterevidence. As NPIs of different strength are shown to become NPIs due to different reasons given the distinct learning pathways, we conclude that there exists no single class of NPIs as a grammatical category. It is merely a coincidence that the so-called NPIs manifest themselves as one phenomenon as they all exhibit a restricted distribution to one or another set of negative contexts in the negative hierarchy (Figure 2).

Our novel approach to NPI-hood from the perspective of language acquisition also leads to suggestions for further research. As we focused on production data only, which is the distribution of the NPIs in spontaneous child speech, we were not able to measure children's absolute knowledge on the NPIs. Since production may not always represent the full range of linguistic knowledge acquired by a child, experiments with manipulated licensing or even non-licensing environments for NPIs are necessary. Another topic for further exploration involves the acquisition of NPIs of different strengths from other languages. Practical limitations prevented us

160 Acquiring Negative Polarity Items

from investigating more than one NPI of the same strength and/or from the same language; a larger sample of NPIs is absolutely necessary for more reliable and valid results from a typological perspective.

Chapter VII

Conclusion

In this dissertation I investigated the acquisition of three NPIs selected from three languages. They were Dutch *hoeven* 'need', English *any*, and Mandarin *shenme* 'a/some'. These NPIs do not only differ in their polarity strengths (*any* and *shenme* are weak and superweak NPIs, respectively, whereas *hoeven* exhibits a strength between strong and weak NPIs), but they also belong to different syntactic categories (*hoeven* is a modal verb, whereas *any* and *shenme* are indefinites) (cf. Chapter I). The acquisition of the Dutch and Mandarin NPIs is investigated in the two corpus studies and experiments (Chapter II to V), and the learnability of the English NPI *any* is examined against corpus data (Chapter VI).

In this chapter, I will summarise the main findings of this dissertation and answer the research questions introduced in Chapter I. In Section 1, I will provide a solution to the learnability problem raised by the existence of NPIs in natural languages. In Section 2, I will present the different learning pathways that are attested in the acquisition of the three selected NPIs. After that, in Section 3, I will answer the question of what language acquisition tells us about why NPIs (of different strengths or categories) have become NPIs.

1 The learnability problem

The existence of NPIs in natural languages leads to a learnability problem for language-acquiring children. Without being confronted with negative evidence, such as corrective feedback or explicit instructions on what is ungrammatical and impossible in a target language, how are children able to detect that NPIs are restricted in their distribution to certain negative contexts only? Since absence of evidence is not evidence of absence, the fact that ungrammatically uttered NPIs in non-licensing environments are absent in the language input does not necessarily indicate that NPIs are ungrammatical in those non-licensing contexts. At first sight, it may therefore appear that children are unable to acquire NPIs in a way that allows them to know to what kind of negative contexts NPIs are limited.

The results of three corpus studies in the CHILDES database (in which all of the three selected NPIs were analysed) and two experiments with an elicited imitation task (in which Dutch *hoeven* and Mandarin *shenme* were investigated) provide evidence that children employ a conservative widening learning strategy in their acquisition of the NPIs (cf. Manzini and Wexler 1987; Snyder 2008; Van der Wal 1996). The conservative widening learning strategy hypothesises that language acquisition exhibits a widening learning pattern, conservatively driven by language input, which can be

162 Acquiring Negative Polarity Items

described as follows. In the acquisitional onset, language learners start with the strictest possible analysis of their target language based on input evidence, which they are confronted with and able to analyse or process in the initial stages. In subsequent stages, if language learners are confronted with input evidence that falsifies the initial, strict analysis of the target language, they extend that narrow analysis and establish a less strict analysis in order to account for the falsifying input evidence. Such an iterative process continues until, at a certain stage of acquisition, language learners construct an analysis that is in agreement with all input data throughout the whole process of language development.

The above-described conservatively widening learning pattern is attested for all of the three selected NPIs – irrespective of their syntactic categories or polarity strengths. The acquisition of the three NPIs all show a two-stage development. In particular, children from different linguistic backgrounds (i.e. Dutch, English, and Mandarin) all start with a narrow assumption of the selected NPIs, triggered by input evidence, and establish a less narrow analysis of the NPIs in the subsequent stage when confronted with, or able to analyse and process more input data that falsify the initial narrow assumption.

As for each of the three selected NPIs, it is moreover attested that children, during the acquisition of NPIs, indeed merely rely on positive evidence (i.e. language input). Absence of negative evidence (such as corrective feedback on ungrammaticality of *any* in the simple past tense) does not seem to prevent children from successfully detecting the restricted distributions of the NPIs. Moreover, absence of sentences like *Max kissed any girls last Friday* in the language input is not a hindering factor in this respect either. The solution to the learnability problem raised by the existence of NPIs in natural language is therefore children's employment of the conservative widening learning mechanism.

2 The acquisitional patterns

The second research question addressed in this dissertation was what possible learning pathway(s) can be attested in the acquisition of NPIs. Does the acquisition of NPIs of different syntactic categories, polarity strengths, and from different languages exhibit similar, or rather distinct developmental patterns? Section 1 already concludes that the learnability problem of NPIs turns out to be solved by children's employment of the conservative widening learning strategy – irrespective of the syntactic categories or strengths of the NPIs, or their linguistic backgrounds. Since the same learning mechanism is responsible for the acquisition of NPIs, it would appear at first sight that the acquisition of different NPIs would also exhibit similar learning pathways.

Van der Wal (1996) was the first serious study that proposed a universal learning path for all NPIs. This universal learning path is motivated

based on the subset relationship between the four types of negative contexts distinguished in natural languages, given their logico-semantic properties (i.e. *Anti-Morphic*, *Anti-Additive*, *Downward Entailing*, and *nonveridical* contexts), also known as the negative hierarchy in the literature (cf. Giannakidou and Zwarts 1999; Zwarts 1995):

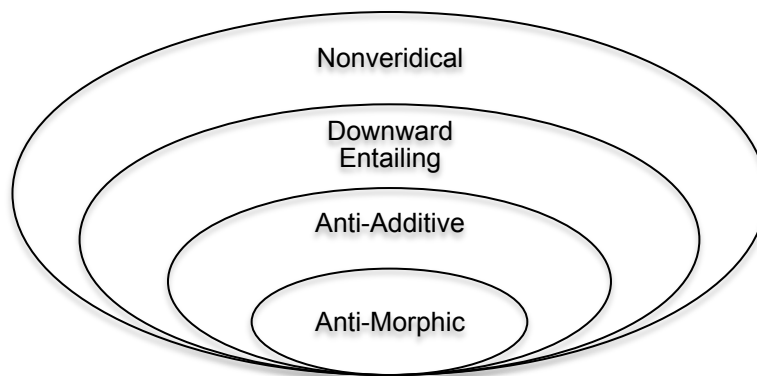


Figure 1: The negative hierarchy

Under the hypothesis of conservative widening, Van der Wal (1996) proposed that the acquisition of NPIs is expected to show the following pathway. Children start by using Anti-Morphic contexts only to license an NPI, and extend the set of Anti-Morphic contexts to an ever broader set of negative contexts along the negative hierarchy to license this NPI according to language input. The widening process from Anti-Morphic via Anti-Additive to Downward Entailing, and sometimes even to nonveridical contexts continues until, eventually, the adult set of licensers for each individual NPI is established.

However, this universal learning path of NPIs is confronted with two problems. One problem is theoretically motivated. That is, why would children start by analysing every NPI as a superstrong NPI that is only allowed in Anti-Morphic environments? In order to force children onto this universal learning path of NPIs, it seems that we need to assume some kind of innate knowledge on which words or expressions are, or can be, NPIs. But what would this knowledge be? And how would this knowledge be represented in our grammar?

Another problem for Van der Wal's universal learning path of NPIs is that it does not match empirical results. Both the corpus and the experimental results obtained in the current dissertation provide counterevidence. NPIs of different categories and strengths, and from different languages, turn out to exhibit distinct acquisitional pathways – although one and the same learning mechanism is attested to be responsible for the acquisition.

During child Dutch development, the distribution of the modal verb

164 Acquiring Negative Polarity Items

NPI *hoeven* is attested to demonstrate the following pattern. In early child Dutch, which is when children are younger than the age of four, *hoeven* is only allowed to appear in the scope of the sentential negative marker *niet* 'not' or the negative indefinite *geen* 'no(ne)'. Later on, the modal NPI is also allowed with other (weaker) negative expressions such as *niemand* 'nobody', *niks* 'nothing', *weinig* 'few' and *alleen* 'only'.

English *any*, on the other hand, exhibits a different acquisitional pattern. Before age four, English-acquiring children seem to almost always utter the NPI in the scope of the sentential negation *not*, or in polar questions with a presumably negative bias. In late child language, however, the distribution of the English NPI is extended. Rather than only under the scope of *not*, or in negatively biased polar questions, children older than the age of four also use *any* in other Downward Entailing contexts, such as in the scope of a negative indefinite, or in conditional clauses.

As for the Mandarin NPI *shenme*, finally, a completely distinct learning path is attested. Children around the age of three are already able to use *shenme* in *wh*-questions in a target-like way, whereas late three-year-olds turn out to be able to license the NPI in a significantly wider set of nonveridical contexts than *wh*-interrogatives only. Examples are negative contexts introduced by a sentential negative marker *bu* 'not' or *mei* 'not', conditional clauses, and epistemic uncertainty contexts.

Clearly, there exists no universal learning path in the acquisition of NPIs. Children do not acquire NPIs of different syntactic categories, polarity strengths, or from different languages by extending their distributions in the negative contexts along the negative hierarchy (cf. Figure 1). Individual NPIs are rather shown to exhibit their own developmental patterns during acquisition. But what determines the acquisitional patterns of individual NPIs? Here, I propose two factors.

One factor concerns the distributional properties of language input; in particular, the most frequently attested licensing context(s) for NPIs in child-directed speech. This factor explains why not all NPIs show the same distributional pattern in the acquisitional onset. Take the Mandarin NPI *shenme*, as an example. The investigation of the distribution of *shenme* in child-directed Mandarin shows that this NPI appears in *wh*-interrogatives more than 97% of the time. Given the overwhelming occurrence of *shenme* in *wh*-questions, it would be unexpected – if not incomprehensible – from the perspective of conservative widening if Mandarin children started off with using *shenme* in the scope of an Anti-Morphic context only.

Another factor that may result in distinct acquisitional patterns of individual NPIs concerns the common (semantic) property underlying the different kinds of licensing contexts for NPIs in child-directed speech. This factor accounts for why not all NPIs follow exactly the same widening pattern along the negative hierarchy (Figure 1). Here I take the two indefinite NPIs investigated in this dissertation as examples: English *any* and Mandarin *shenme*. Given the fact that in child-directed speech, *any* and *shenme* are attested in different Downward Entailing and nonveridical contexts, respectively, it can hardly be the case that English and Mandarin children

would come up with the same semantic property that describes the set of licensing contexts for the corresponding NPIs in their own language.

Although NPIs of different categories and strengths, and from different languages, exhibit distinct acquisitional patterns, there is one similarity. That is, the acquisition of different NPIs all show a widening pattern in their distributions during child language development from a restricted to a less restricted set of possible licensing contexts. This indicates that children are developing from a strict to less strict analysis of the NPIs during acquisition, under the conservative widening learning, which prevents them from establishing an overgeneralising grammar.

3 Reasons underlying NPI-hood

The final research question investigated in this dissertation looking at the acquisition of different NPIs was why NPIs exhibit polarity sensitivity and have become NPIs (the so-called *licensee* question in Ladusaw 1996). The reason why acquisition was chosen as a window on the nature of NPI-hood concerns the reasoning that how we analyse our native language is a product of how we have acquired this language. This suggests that the reason underlying the status of NPIs must be represented or evident in the analysis or the representation of the NPIs in our language system. Thus, in order to explore the reasons and/or properties underlying NPI-hood, the analyses of the three selected NPIs that emerged in late child language were investigated. This was done by hypothesising an underlying analysis or representation of the NPIs based on their distributional patterns in late child language, also taking into consideration how the NPIs are distributed in early child language.

Results of the current exploration of the acquisition of the three NPIs lead to the conclusion that different NPIs have become NPIs due to completely different reasons. As for Dutch *hoeven*, the results of both corpus and experimental studies suggest that Dutch children eventually establish a lexical association between the NPI on the one hand, and an abstract negation NEG on the other. By adopting Postal's approach to NPI-hood (2000; see also Collins and Postal 2014), it is further hypothesised that *hoeven* is represented as [HOEVEN NEG] in the learners' mental lexicon at the late stage of the acquisition. This analysis gives rise to a distributional pattern of the Dutch NPI restricted to those specific contexts that can be decomposed as containing NEG. This means Dutch *hoeven* has become an NPI due to its lexical connection with an abstract negative form NEG.

However, the English NPI *any* does not share the same underlying analysis. The results collected from spontaneous child speech (via CHILDES) turn out to support the hypothesis that English four-year-olds assign a σ -feature to the NPI, which forces it to appear only in those contexts in which exhaustification does not give rise to a logical contradiction (cf. Chierchia 2004, 2006, 2013). Given the acquisitional results, I thus argue

166 Acquiring Negative Polarity Items

– following Chierchia – that *any* has gained its polarity sensitivity because it bears a σ -feature and therefore must be exhaustified.

The reason underlying *shenme*'s status as an NPI again differs from both hypothesised above. The corpus and experimental results show that at least Mandarin four-year-olds are already able to license this NPI in the whole array of nonveridical environments, which are all contexts that do not presuppose the existence of a referent (cf. Giannakidou 1998). The analysis that I adopt to explain such a wide distributional pattern of *shenme* in late child Mandarin is that *shenme* contains a dependent variable, which makes it referentially deficient and hence restricted by nonveridicality (cf. Giannakidou 2002, 2010, 2011).

Clearly, the exploration of the acquisition of the three NPIs provides evidence for different analyses or representations of NPIs of different categories and strengths. The current investigation of the acquisition of NPIs moreover suggests that there exists no single class of NPIs, as a homogeneous grammatical category. NPIs of different syntactic categories, polarity strengths, and from different languages have become NPIs due to different reasons – given their distinct acquisitional pathways. No universal set of licensing contexts exists for NPIs, either. It is therefore merely a coincidence that the so-called NPIs manifest themselves as one phenomenon, as they all exhibit a restricted distribution to one or another set of negative contexts in the negative hierarchy (cf. Van der Wouden 1997).

References

- An, Duk-Ho. 2007. On the distribution of NPIs in Korean. *Natural Language Semantics* 15:317-350.
- Asher, Nicholas, and Brian Reese. 2005. Negative bias in polar questions. In *Proceedings of Sinn und Bedeutung (SuB) 9*:30-43, eds. Maier, Emar, Corien Bary, and Janneke Huitink. Nijmegen: the Nijmegen Centre of Semantics (NCS).
- Baker, C. Carl Lee, and John Joseph MacCarthy. 1981. *The logical problem of language acquisition*. Cambridge, MA: MIT Press.
- Beck, Sigrid, and Hotze Rullmann. 1999. A flexible approach to exhaustivity in questions. *Natural Language Semantics* 7:249-298.
- Berwick, Robert C. 1985. *The acquisition of syntactic knowledge*. Cambridge, MA: MIT Press.
- Berwick, Robert C., and Amy S. Weinberg. 1986. *The grammatical basis of linguistic performance: language use and acquisition*. Cambridge, MA: MIT Press.
- Bishop, Dorothy VM, and Catherine Adams. 1990. A prospective study of the relationship between specific language impairment, phonological disorders and reading retardation. *Journal of Child Psychology and Psychiatry* 31:1027-1050.
- Bol, Gerard, and Folkert Kuiken. 1990. Grammatical analysis of developmental language disorders: A study of the morphosyntax of children with specific language disorders, with hearing impairment and with Down's syndrome. *Clinical Linguistics & Phonetics* 4:77-86.
- Bowerman, Melissa. 1982. Reorganizational processes in lexical and syntactic development. In *Language acquisition: The state of the art*, 319-346, eds. Gleitman, Lila R., and Eric Wanner. Cambridge: Cambridge University Press.
- Boyd, Jeremy K., and Adele E. Goldberg. 2011. Learning what NOT to say: The role of statistical preemption and categorisation in a-adjective production. *Language* 87:55-83.
- Braine, Martin DS. 1971. On two types of models of the internalization of grammars. In *The ontogenesis of grammar*, 153-186, ed. Slobin, Dan Isaac. New York: Academic Press.
- Brown, Roger. 1973. *A first language: The early stages*. Cambridge, MA: Harvard University Press.
- Brown, Roger, and Camille Hanlon. 1970. Derivational complexity and order of acquisition in child speech. In *Cognition and the development of language*, 11-54, ed. John R. Hayes. New York: John Wiley & Sons Inc.
- Cartwright, Timothy A., and Michael R. Brent. 1997. Syntactic categorisation in early language acquisition: formalizing the role of distributional analysis. *Cognition* 63:121-170.

168 Acquiring Negative Polarity Items

- Cheng, Lisa Lai-Shen. 1991. *On the Typology of Wh-Questions*. Doctoral Dissertation, MIT, Cambridge, MA.
- Cheng, Lisa Lai-Shen. 1994. Wh-words as Polarity Items. *Chinese Languages and Linguistics* 2:615-640.
- Cheng, Lisa Lai-Shen. 1995. On *dou*-quantification. *Journal of East Asian Linguistics* 4:197-234.
- Cheng, Lisa Lai-Shen, and Cheng-Teh James Huang. 1996. Two types of donkey sentences. *Natural Language Semantics* 4:121-163.
- Chierchia, Gennaro. 2004. Scalar implicatures, polarity phenomena, and the syntax/pragmatics interface. *Structures and beyond* 3:39-103.
- Chierchia, Gennaro. 2006. Broaden your views: Implicatures of domain widening and the “logicality” of language. *Linguistic Inquiry* 37:535-590.
- Chierchia, Gennaro. 2013. *Logic in grammar: Polarity, free choice, and intervention*. Oxford: Oxford University Press.
- Chiu, Bonnie. 1990. A case of quantifier floating in Mandarin Chinese. Paper presented at *The Second North America Conference on Chinese Linguistics (NECCL-2)*. University of Pennsylvania, Philadelphia.
- Chomsky, Noam. 1964. Formal discussion. In *The Acquisition of Language. Monographs of the Society for Research in Child Development*. 29 (1, Serial No. 92):35-39, eds. Bellugi, Ursula, and Roger Brown.
- Chomsky, Noam. 1972. *Problems of knowledge and freedom: the Russell lectures*. Fontana/Collins.
- Chomsky, Noam. 1975. *Reflections on language*. New York: Random House.
- Chomsky, Noam. 1981. *Lectures on Government and Binding*. Dordrecht: Foris.
- Chomsky, Noam, and Howard Lasnik. 1977. Filters and control. *Linguistic Inquiry* 8:425-504.
- Clark, Eve V. 1987. The principle of contrast: A constraint on language acquisition. In *Mechanisms of language acquisition*, 1-34, ed. MacWhinney, Brian. Hillsdale, NJ: Erlbaum.
- Clark, Eve V. 1995. *The lexicon in acquisition*. Cambridge: Cambridge University Press.
- Collins, Chris, and Paul M. Postal. 2014. *Classical NEG Raising: An Essay on the Syntax of Negation*. Cambridge, MA: MIT Press.
- Cowie, Fiona. 1997. The logical problem of language acquisition. *Synthese* 111:17-51.
- Crain, Stephen, and Rosalind Thornton. 2006. Acquisition of syntax and semantics. In *Handbook of Psycholinguistics*, 1073-1110, eds. Traxler, Matthew J., and Morton A. Gernsbacher. Amsterdam: Elsevier.
- Cruttenden, Alan. 1978. Assimilation in child language and elsewhere. *Journal of child language* 5:373-378.
- Crystal, David, Paul Fletcher, and Michael Garman. 1989. *Grammatical analysis of language disability*. London: Cole and Whurr.
- De Haan, Gerard. 1986. *De rol van morfologie en syntaxis in de ontwikkeling van het werkwoord* [The Role of Morphology and Syntax in the Development of the Verb]. *Glott* 9:28-41.

- Ding, Sheng-Shu. 1961. *Xiandai Hanyu Yufa JiangHua* [Speeches on Modern Chinese Grammar]. Beijing: The Commercial Press.
- Drenhaus, Heiner, Joanna Blaszczak, and Juliane Schütte. 2006. An ERP study on the strength of licensors in negative polarity constructions. Manuscript, University of Potsdam.
- Drenhaus, Heiner, Douglas Saddy, and Stefan Frisch. 2005. Processing negative polarity items: When negation comes through the backdoor. In *Linguistic evidence: Empirical, theoretical, and computational perspectives*, 145-165, eds. Kepsar Stephan, and Marga Reis. The Hague: Mouton de Gruyter.
- Drenhaus, Heiner, Peter Beim Graben, Douglas Saddy, and Stefan Frisch. 2006. Diagnosis and repair of negative polarity constructions in the light of symbolic resonance analysis. *Brain and language* 96:255-268.
- Eisenbeiss, Sonja. 2010. Production methods in language acquisition research. In *Experimental Methods in Language Acquisition Research*, 11-34, eds. Blom, Elma, and Sharon Unsworth. Amsterdam: John Benjamins.
- Elbers, Loekie, and Frank Wijnen. 1992. Effort, production skill, and language learning. In *Phonological development: Models, research, implications*, 337-368, eds. Ferguson, Charles Albert, Lise Menn, and Carol Stoel-Gammon. York: York Press.
- Fauconnier, Gilles. 1975. Pragmatic scales and logical structure. *Linguistic Inquiry* 6:353-375.
- Fauconnier, Gilles. 1978. Implication reversal in a natural language. In *Formal semantics and pragmatics for natural languages*, 289-301, eds. Guenther, Franz, and Siegfried J. Schmidt. The Netherlands: Springer.
- Fauconnier, Gilles. 1980. Pragmatic entailment and questions. In *Speech act theory and pragmatics*, 57-69, eds. Searle, John R., Ferenc Kiefer, and Manfred Bierwisch. The Netherlands: Springer.
- Fikkert, Paula. 1994. *On the acquisition of prosodic structure*. Doctoral Dissertation, Leiden University, Leiden.
- Fletcher, Paul, and Michael Garman. 1988. Normal language development and language impairment: Syntax and beyond. *Clinical Linguistics & Phonetics* 2:97-113.
- Foraker, Stephani, and Brian McElree. 2007. The role of prominence in pronoun resolution: Active versus passive representations. *Journal of Memory and Language* 56:357-383.
- Forrester, Michael. 2002. Appropriating cultural conceptions of childhood: Participation in conversation. *Childhood* 9:255-278.
- Fujiki, Martin, and Bonnie Brinton. 1987. Elicited Imitation Revisited: A Comparison with Spontaneous Language Production. *Language, Speech, and Hearing Services in Schools* 18:301-311.
- Gallimore, Ronald, and Roland G. Tharp. 1981. The interpretation of elicited sentence imitation in a standardized context. *Language Learning* 31:369-392.

170 Acquiring Negative Polarity Items

- Giannakidou, Anastasia. 1997. *The landscape of polarity items*. Doctoral Dissertation, University of Groningen, Groningen.
- Giannakidou, Anastasia. 1998. *Polarity sensitivity as (non)veridical dependency*. Amsterdam: John Benjamins.
- Giannakidou, Anastasia. 1999. Affective dependencies. *Linguistics and Philosophy* 22:367-421.
- Giannakidou, Anastasia. 2001. The meaning of free choice. *Linguistics and philosophy* 24:659-735.
- Giannakidou, Anastasia. 2002. Licensing and sensitivity in polarity items: from downward entailment to nonveridicality. In *Proceedings of Chicago Linguistic Society (CLS)* 38:29-53, eds. Andronis, Mary, Erin Debenport, Anne Pycha, and Keiko Yoshimura. Chicago: University of Chicago Press.
- Giannakidou, Anastasia. 2006. N-words and negative concord. *The Syntax Companion* 3:327-391.
- Giannakidou, Anastasia. 2010. The dynamics of change in Dutch *enig*: from nonveridicality to strong negative polarity. *Natural Language & Linguistic Theory* 28:861-875.
- Giannakidou, Anastasia. 2011. Negative polarity and positive polarity: Licensing, variation, and compositionality. In *The handbook of Natural Language Meaning*, 1660-1712, eds. Maienborn, Claudia, Klaus von Stechow, and Paul Portner. Berlin: Mouton de Gruyter.
- Giannakidou, Anastasia, and Lisa Lai-Shen Cheng. 2006. (In)Definiteness, Polarity, and the Role of wh-morphology in Free Choice. *Journal of Semantics* 23:135-183.
- Giannakidou, Anastasia, and Josep Quer. 2013. Exhaustive and non-exhaustive variation with anti-specific indefinites: free choice versus referential vagueness. *Lingua* 126:120-149.
- Giannakidou, Anastasia, and Suwon Yoon. 2011. Referential vagueness and negative polarity: evidence from Greek and Korean. In *Proceedings of Chicago Linguistic Society (CLS)* 47. Chicago: University of Chicago Press.
- Giannakidou, Anastasia, and Frans Zwarts. 1999. Aspectual properties of temporal connectives. In *Greek Linguistics '97: Proceedings of the 3rd International Conference on Greek Linguistics*, 104-113, ed. Mozer, Amalia. Athens: Ellinika Grammata.
- Gold, E. Mark. 1967. Language identification in the limit. *Information and Control* 10:447-474.
- Goldberg, Adele E. 1993. Another look at some learnability paradoxes. In *The Proceedings of the Twenty-Fifth Annual Child Language Research Forum*, 60-75, ed. Clark, Eve V. Stanford, CA: CSLI Publications.
- Goldberg, Adele E. 1995. *Constructions: A construction grammar approach to argument structure*. Chicago: University of Chicago Press.
- Goldberg, Adele. 2006. *Constructions at work: The nature of generalization in language*. Oxford: Oxford University Press.
- Goldberg, Adele E. 2009. The nature of generalization in language. *Cognitive Linguistics* 20:93-127.

- Goldberg, Adele E. 2011. Corpus evidence of the viability of statistical preemption. *Cognitive Linguistics* 22:131-153.
- Goldsmith, John A. 1976. *Autosegmental phonology*. Doctoral Dissertation, MIT, Cambridge, MA.
- Goldsmith, John A. 1980. Meaning and mechanism in grammar. *Harvard studies in syntax and semantics* 3:423-428.
- Grimshaw, Jane. 1981. Form, function and the Language Acquisition Device. In *The Logical Problem of Language Acquisition*, 165-182. eds. Baker, C. Carl Lee, and John McCarthy Joseph. Cambridge, MA: MIT Press.
- Groenendijk, Jeroen, and Martin Stokhof. 1984. On the semantics of questions and the pragmatics of answers. *Varieties of formal semantics* 3:143-170.
- Gropen, Jess, Steven Pinker, Michelle Hollander, and Richard Goldberg. 1991. Affectedness and direct objects: The role of lexical semantics in the acquisition of verb argument structure. *Cognition* 41:153-195.
- Guerzoni, Elena. 2003. *Why even ask?: on the pragmatics of questions and the semantics of answers*. Doctoral dissertation, MIT, Cambridge, MA.
- Guerzoni, Elena, and Yael Sharvit. 2007. A question of strength: on NPIs in interrogative clauses. *Linguistics and Philosophy* 30:361-391.
- Hala, Suzanne, and Jeremy Carpendale. 1997. All in the mind: Children's understanding of mental life. *The development of social cognition* 2:189-239.
- Hamayan, Else, Joel Saegert, and Paul Larudee. 1977. Elicited imitation in second language learners. *Language and speech* 20:86-97.
- Hamblin, Charles L. 1973. Questions in montague English. *Foundations of language* 10:41-53.
- Haspelmath, Martin. 1997. *Indefinite pronouns*. Oxford: Clarendon Press.
- Heim, Irene. 1994. Interrogative semantics and Karttunen's semantics for know. In *Proceedings of the Annual Meeting of the Israel Association for Theoretical Linguistics (IATL)* 9:128-144.
- Henry, Alison. 1995. *Belfast English and Standard English: Dialect variation and parameter setting*. New York: Oxford University Press.
- Herburger, Elena. 2003. A note on Spanish *ni siquiera*, even, and the analysis of NPIs. *Probus* 15:237-256.
- Hoeksema, Jack. 1994. On the grammaticalization of negative polarity items. In *Proceedings of the Annual Meeting of the Berkeley Linguistics Society General Session Dedicated to the Contributions of Charles J. Fillmore* 20(1):273-282. Berkeley, Berkeley Linguistics Society.
- Hoeksema, Jack. 1997. Corpus study of negative polarity items. In *IV-V Jornades de corpus linguistics, 1996-1997*, 67-86, eds. Turell Maria Teresa, and Enric Vallduví. Barcelona: Institut Universitari de Lingüística Aplicada.
- Hoeksema, Jack. 1999. *Aantekeningen bij ooit, deel 2: De opkomst van niet-polair ooit* [Notes on *ooit* 'ever', part 2: the rise of non-polarity *ooit*]. *TABU: Bulletin voor Taalwetenschap* 29:147-172.

172 Acquiring Negative Polarity Items

- Hoeksema, Jack. 2000. Negative polarity items: triggering, scope and c-command. In *Negation and Polarity: syntactic and semantic perspectives*, 115-146, eds. Horn, Laurence, and Yasuhiko Kato. New York: Oxford University Press.
- Hoeksema, Jack. 2013. *De negatief-polaire uitdrukkingen van het Nederlands* [Negative Polarity Expressions in Dutch]. Manuscript, University of Groningen.
- Homer, Vincent. 2011. *Polarity and Modality*. Doctoral Dissertation, University of California, Los Angeles.
- Horn, Laurence R. 1989. *A natural history of negation*. Chicago: University of Chicago Press.
- Horn, Laurence R. 1996. Exclusive company: *Only* and the dynamics of vertical inference. *Journal of Semantics* 13:1-40.
- Horn, Laurence R. 2000. *any* and *(-)ever*: Free choice and free relatives. In *Proceedings of the Annual Meeting of the Israel Association for Theoretical Linguistics (IATL)* 15:71-111. Jerusalem: Akademon.
- Horn, Laurence R. 2005. Airport'86 revisited: Toward a unified indefinite *any*. In *Reference and Quantification: The Partee Effect*, 179-205. eds. Pelletier, Francis Jeffrey, and Gregory Carlson. Stanford: CSLI Publications.
- Howe, Christine. 1981. *Acquiring language in a conversational context*. London: Academic Press.
- Huang, Ai-Jun. 2014. Acquisition of Polarity-Sensitive Items in Mandarin Chinese. *Language Acquisition* 21:212-214.
- Huang, Ai-Jun, and Stephen Crain. 2014a. Polarity sensitive expressions in child Mandarin. *Language Acquisition* 21:339-364.
- Huang, Ai-Jun, and Stephen Crain. 2014b. Acquisition of the polarity sensitive item *renhe* 'any' in Mandarin Chinese. *Journal of child language* 41(4): 861-889.
- Huang, James Cheng-Teh. 1982. *Logical relations in Chinese and the theory of grammar*. Doctoral Dissertation, MIT, Cambridge, MA.
- Huang, James Cheng-Teh. 1993. Reconstruction and the structure of VP: Some theoretical consequences. *Linguistic Inquiry* 24:103-138.
- Iatridou, Sabine, and Hedde Zeijlstra. 2010. On the scopal interaction of negation and deontic modals. In *Logic, Language and Meaning* (6042): 315-324, eds. Aloni, Maria, Harald Bastiaanse, Tikitou de Jager, and Katrin Schulz. Berlin Heidelberg: Springer.
- Iatridou, Sabine, and Hedde Zeijlstra. 2013. Negation, Polarity, and Deontic Modals. *Linguistic Inquiry* 44:529-568.
- Israel, Michael. 1996. Polarity sensitivity as lexical semantics. *Linguistics and Philosophy* 19:619-666.
- Israel, Michael. 1997. The scalar model of polarity sensitivity: the case of the aspectual operators. *Amsterdam Studies in the Theory and History of Linguistic Science* 4:209-230.
- Israel, Michael. 1998. Ever: Polysemy and polarity sensitivity. *Linguistic Notes from La Jolla* 19:29-45.

- Israel, Michael. 2001. Minimizers, maximizers and the rhetoric of scalar reasoning. *Journal of Semantics* 18:297-331.
- Israel, Michael. 2004. The pragmatics of polarity. In *The handbook of pragmatics*, 701-723, eds. Horn, Laurence R., and Gregory Ward. Oxford: Blackwell Publishing.
- Jacobs, Joachim. 1980. Lexical decomposition in Montague Grammar. *Theoretical Linguistics* 7:121-136.
- Kadmon, Nirit, and Fred Landman. 1993. Any. *Linguistics and Philosophy* 16:353-422.
- Karmiloff-Smith, Annette. 1986. From meta-processes to conscious access: Evidence from children's metalinguistic and repair data. *Cognition* 23:95-147.
- Keenan, Edward L., and Sarah Hawkins. 1987. The psychological validity of the accessibility hierarchy. *Universal grammar* 15:60-85.
- Kenney, Terrence J., and Jean Wolfe. 1972. The acquisition of agreement in English. *Journal of Verbal Learning and Verbal Behaviour* 11:698-705.
- Klima, Edward. 1964. Negation in English. In *The structure of language*, 246-323, eds. Fodor, Jerry A., and Jerrold J. Katz. Englewood Cliffs, NJ : Prentice-Hall.
- Koster, Charlotte, and Sjoukje Van der Wal. 1996. Acquisition of negative polarity items. In *Child Language*, 92-102, ed. Michelle Aldridge. Clevedon, Avon: Multilingual Matters, Ltd.
- Kratzer, Angelika. 1981. The notional category of modality. In *Words, worlds, and contexts*, 38-74, eds. Eikmeyer, Hans-Jügen, and Hannes Rieser. Berlin: de Gruyter.
- Kratzer, Angelika. 1991. Modality/Conditionals. In *Semantik: ein internationales Handbuch der zeitgenössischen Forschung* [Semantics: An International Handbook of Contemporary Research] 6:639-656, eds. Von Stechow, Arnim, and Dieter Wunderlich. Berlin: Walter de Gruyter.
- Krifka, Manfred. 1995. The semantics and pragmatics of polarity items. *Linguistic analysis* 25:209-257.
- Ladusaw, William A. 1979. *Negative polarity items as inherent scope relations*. Doctoral Dissertation, University of Texas at Austin.
- Ladusaw, William A. 1996. Negation and polarity items. In *The Handbook of Contemporary Semantic Theory*, 321-341, ed. Lappin, Shalom. Oxford and Malden: Blackwell Publishing.
- Laka, Miren Itziar. 1990. Negation in syntax: On the Nature of Functional Categories and Projections. *Anuario del Seminario de Filología Vasca "Julio de Urquijo"* 25(1): 65-136.
- Lee, Thomas Hun-Tak. 1986. *Studies on quantification in Chinese*. Doctoral Dissertation, University of California.
- Leekam, Sue. 1993. Children's understanding of mind. In *The development of social cognition: The child as psychologist*, 26-61, ed. Bennett, Mark. New York: Guilford Press.
- Leonard, Laurence B. 2014. *Children with specific language impairment*. Cambridge, MA: MIT press.

174 Acquiring Negative Polarity Items

- Levelt, Clara Cecilia. 1994. *On the acquisition of place: proefschrift*. Doctoral Dissertation, Leiden University, Leiden.
- Li, Audrey Ye-Hui. 1992. Indefinite Wh in Mandarin Chinese. *Journal of East Asian linguistics* 1:125-155.
- Li, Jin-Xi. 1924. *Xin Zhu Guoyu Wenfa* [New Chinese Grammar]. Shanghai: The Commercial Press.
- Li, Yu-Ming. 2002. *Yufa Yanjiulu* [Record on Grammar Research]. Beijing: Commercial Press.
- Lieven, Elena, Dorothé Salomo, and Michael Tomasello. 2009. Two-year-old children's production of multiword utterances: A usage-based analysis. *Cognitive Linguistics* 20:481-507.
- Lin, Jing. 2011a. Mandarin *shenme* as a negative polarity item: distribution, interpretation and acquisition. rMA Thesis, University of Amsterdam, Amsterdam.
- Lin, Jing. 2011b. Mandarin *shenme* as a Negative Polarity Item: a semantic approach. Paper presented at *The 9th Semantics in the Netherlands day (SiN IX)*, Utrecht University.
- Lin, Jing. Under review. Distributionally constrained items in child language: acquisition of the superweak NPI *shenme* 'a/some' in Mandarin Chinese.
- Lin, Jing, and Anastasia Giannakidou. Submitted. No exhaustivity for the Mandarin NPI *shenme*.
- Lin, Jing, and Hedde Zeijlstra. 2012. Mandarin *shenme* as a Negative Polarity Item: evidence from first language acquisition. In *Pre-proceedings of the International Conference Linguistic Evidence 2012: Empirical, theoretical and computational perspectives*, 271-276. University of Tübingen, Tübingen.
- Lin, Jing, Fred Weerman, and Hedde Zeijlstra. 2013. Same strategy, distinct pathways: explaining the learnability of NPIs and their strength. Paper presented at *The 39th Incotro di Grammatica Generativa (IGG39)*, University of Modena and Reggio, Modena.
- Lin, Jing, Fred Weerman, and Hedde Zeijlstra. 2014. Mandarin SHENME as a superweak NPI. In *Black Book: a festschrift in honor of Frans Zwarts*, 229-251, eds. Hoeksema, Jack, and Dicky Gilbers. Groningen: University of Groningen.
- Lin, Jing, Fred Weerman, and Hedde Zeijlstra. 2015. Emerging NPIs: The acquisition of Dutch *hoeven* 'need'. *The Linguistic Review* 32(2):333-374.
- Lin, Jing, Fred Weerman, and Hedde Zeijlstra. Under revision. A learning path from lexical frames to abstract knowledge: evidence from Dutch children's acquisition of NPI modal *hoeven* 'need'.
- Lin, Jing, Fred Weerman, and Hedde Zeijlstra. To be submitted. NPIs of different strengths are NPIs for different reasons: what language acquisition tells us about the nature of NPIs.
- Lin, Jo-Wang. 1996. *Polarity licensing and wh-phrase quantification in Chinese*. Doctoral Dissertation, University of Massachusetts, Amherst, MA.

- Lin, Jo-Wang. 1998. On Existential Polarity WH-Phrases in Chinese. *Journal of East Asian Linguistics* 7:219-255.
- Lust, Barbara, Suzanne Flynn, and Claire Foley. 1996. What children know about what they say: Elicited imitation as a research method for assessing children's syntax. In *Methods for assessing children's syntax*, 55-76, eds. McDaniel, Dana, Cecile McKee, and Helen Smith Cairns. Cambridge, MA: MIT Press.
- MacWhinney, Brian. 2009. The childes project. *Tools for analysing talk – electronic edition 2*.
- MacWhinney, Brian, Talmy Givón, and Bertram F. Malle. 2002. The gradual emergence of language. In *The evolution of language out of pre-language* 53:231-263, eds. Givón, Talmy, and Bertram F. Malle. Amsterdam: John Benjamins.
- Mahajan, Anoop Kumar. 1990. LF conditions on negative polarity licensing. *Lingua* 80:333-348.
- Manzini, M. Rita, and Kenneth Wexler. 1987. Parameters, binding theory, and learnability. *Linguistic Inquiry* 18:413-444.
- Maratsos, M. 1987. Gift of tongues. *Times Literary Supplement*, 19.
- Marcotte, Jean-Philippe. 2005. *Causative alternation errors in child language acquisition*. Doctoral Dissertation, Stanford University.
- Marcus, Gary F. 1993. Negative evidence in language acquisition. *Cognition* 46:53-85.
- Marcus, Gary F., Steven Pinker, Michael Ullman, Michelle Hollander, T John Rosen, Fei Xu, and Harald Clahsen. 1992. Overregularization in language acquisition. *Monographs of the Society for Research in Child Development* 57(4):i-178.
- McCawley, James D. 1988. *The syntactic phenomena of English*. University of Chicago Press.
- McNeill, David. 1966. Developmental psycholinguistics. *The genesis of language: A Psycholinguistic Approach*, 15-84, eds. Smith, Frank, and George A. Miller. Cambridge, MA: MIT Press.
- Mintz, Toben H. 2002. Category induction from distributional cues in an artificial language. *Memory & Cognition* 30(5): 678-686.
- Mintz, Toben H. 2003. Frequent frames as a cue for grammatical categories in child directed speech. *Cognition* 90 (1): 91-117.
- Mintz, Toben H., Elissa L. Newport, and Thomas G. Bever. 2002. The distributional structure of grammatical categories in speech to young children. *Cognitive Science* 26:393-424.
- Montgomery, Marcia M., Allen A. Montgomery, and M. Irene Stephens. 1978. Sentence repetition in preschoolers: Effects of length, complexity, and word familiarity. *Journal of psycholinguistic research* 7:435-452.
- Nam, Seungho. 1994. Another type of negative polarity item. *Dynamic Polarity and Quantification*, 3-15, eds. Kanazawa, Makoto, and Christopher J. Piñón. Stanford, CA: CSLI Publications.

176 Acquiring Negative Polarity Items

- Ni, Lan. 2005. *Xiandai Hanyu Yiwen Daici De Jiben Yuyi Fenxi* [Basic Semantic study on *wh*-words in Modern Chinese]. *The Northern Forum* 192:55-57.
- Nicolae, Andreea Cristina. 2013. *Any questions? Polarity as a window into the structure of questions*. Doctoral Dissertation, Harvard University, Cambridge, MA.
- Nippold, Marilyn A. 1990. Concomitant speech and language disorders in stuttering children: A critique of the literature. *Journal of Speech and Hearing Disorders* 55:51-60.
- Nippold, Marilyn A., and Ilsa E. Schwarz. 2002. Do children recover from specific language impairment? *International Journal of Speech-Language Pathology* 4:41-49.
- Oostdijk, Nelleke H. J. 2004. *Het Corpus Gesproken Nederlands: Structuur en bruikbaarheid voor taalonderzoek* [The spoken Dutch Corpus: Structure and usefulness for linguists].
- Pan, Hai-Hua. 2006. Focus, tripartite structure, and the semantic interpretation of Mandarin *dou*. *Research and exploration on grammar* 13:163-184.
- Panitsa, Georgia. 2001. Aspects of aspect: Acquiring grammatical aspect in Modern Greek: The interaction of aspect with aspectual adverbials in children's grammars. *UCL Working Papers in Linguistics* 13:405-424.
- Penka, Doris. 2011. *Negative indefinites*. New York: Oxford University Press.
- Penka, Doris. 2012. Split Scope of Negative Indefinites. *Language and Linguistics Compass* 6:517-532.
- Penka, Doris, and Hedde Zeijlstra. 2005. Negative indefinites in Dutch and German. Manuscript, University of Tübingen.
- Pinker, Steven. 1979. Formal models of language learning. *Cognition* 7:217-283.
- Pinker, Steven. 1984. *Language learnability and language development*. Cambridge, MA: Harvard University Press.
- Pinker, Steven. 1995. Language acquisition. *Language: An invitation to cognitive science* 1:135-182.
- Pinker, Steven. 2013. *Learnability and cognition: The acquisition of argument structure*. Cambridge, MA: MIT press.
- Postal, Paul M. 2000. The Ohio lectures on squat. Manuscript, New York University.
- Premack, David, and Guy Woodruff. 1978. Does the chimpanzee have a theory of mind? *Behavioural and brain sciences* 1:515-526.
- Progovac, Ljiljana. 1994. *Negative and positive polarity: A binding approach*. Cambridge: Cambridge University Press.
- Progovac, Ljiljana. 2000. Negative and positive feature checking and the distribution of polarity items. In *Negation in Slavic*, 179-217, eds. Brown, Sue, and Adam Przepiorkowski. Slavica Publishers.
- Redington, Martin, Nick Crater, and Steven Finch. 1998. Distributional information: A powerful cue for acquiring syntactic categories. *Cognitive Science* 22:425-469.

- Romberg, Alexa R., and Jenny R. Saffran. 2010. Statistical learning and language acquisition. *Wiley Interdisciplinary Reviews: Cognitive Science* 1:906-914.
- Rowland, Caroline F., and Sarah L. Fletcher. 2006. The effect of sampling on estimates of lexical specificity and error rates. *Journal of child language* 33:859-877.
- Rullmann, Hotze. 1995. *Geen eenheid* [No unit]. *TABU: Bulletin voor Taalwetenschap* 25(4):194-197.
- Saddy, Douglas, Heiner Drenhaus, and Stefan Frisch. 2004. Processing polarity items: Contrastive licensing costs. *Brain and language* 90:495-502.
- Saffran, Jenny R. 2002. Constraints on statistical language learning. *Journal of Memory and Language* 47:172-196.
- Saffran, Jenny R. 2003. Statistical language learning mechanisms and constraints. *Current directions in psychological science* 12:110-114.
- Santelmann, Lynn M., and Peter W. Jusczyk. 1998. Sensitivity to discontinuous dependencies in language learners: evidence for limitations in processing space. *Cognition* 69:105-134.
- Schaerlaekens, Anne Marie. 1973. *The two-word sentence in child language development*. The Hague: Mouton.
- Schaerlaekens, Anne Marie, and Steven Gillis. 1987. *De taalverwerving van het kind: een hernieuwde oriëntatie in het Nederlandstalig onderzoek* [Child language development: a new orientation in the Dutch research]. Wolters-Noordhoff.
- Scholl, Dennis M., and Ellen Bouchard Ryan. 1980. Development of metalinguistic performance in the early school years. *Language and speech* 23:199-211.
- Schütte, Juliane. 2006. On the Processing of Negative Polarity Constructions: When the Licensor makes the Difference. In *Proceedings of the First Central European Student Conference in Linguistics*, ed. Gyuris, Beáta. Budapest, Hungary.
- Sharvit, Yael. 2002. Emedded questions and 'de dicto' readings. *Natural Language Semantics* 10:97-123.
- Snyder, William. 2008. Children's grammatical conservatism: Implications for linguistic theory. In *An Enterprise in the Cognitive Science of Language: A Festschrift for Yukio Otsu*, 41-51, eds. Sano, Tetsuya, Mika Endo, Miwa Isobe, Koichi Otaki, Koji Sugisaki, and Takeru Suzuki. Tokyo: Hituzi Syobo.
- Stromswold, Karin. 1994. What a mute child tells us about language. Unpublished manuscript, Rutgers University.
- Sybesma, Rint. 1994. The diachronics of verb-*le* in Chinese: Where does the perfective semantics come from? *HAS Yearbook*, 35-44, ed. Van der Velde, Paul. International Institute for Asian Studies, Leiden.
- Sybesma, Rint. 1997. Why Chinese verb-*le* is a resultative predicate. *Journal of East Asian Linguistics* 6:215-261.
- Szabolcsi, Anna. 2004. Positive polarity–negative polarity. *Natural Language & Linguistic Theory* 22:409-452.

178 Acquiring Negative Polarity Items

- Tardif, Twila Zoé. 1993. *Adult-to-child speech and language acquisition in Mandarin Chinese*. Doctoral Dissertation, Yale University, New Haven, CT.
- Tardif, Twila Zoé. 1996. Nouns are not always learned before verbs: Evidence from Mandarin speakers' early vocabularies. *Developmental psychology* 32:492-504.
- Theakston, Anna L., Elena V.M. Lieven, Julian M. Pine, and Caroline F. Rowland. 2001. The role of performance limitations in the acquisition of verb-argument structure: An alternative account. *Journal of child language* 28:127-152.
- Thiessen, Erik D. 2011. Domain general constraints on statistical learning. *Child development* 82:462-470.
- Tieu, Lyn. 2010. The Acquisition of NPI *any* in English: A Case Study. In *Online supplement to the Proceedings of the 34th Boston University Conference on Language Development (BUCLD)*. eds. Franich, Katie, Lauren L. Keil, Kate M. Iserman, and Jande Chandlee.
- Tieu, Lyn. 2011. On the tri-ambiguous status of 'any': The view from child language. In *Proceedings of Semantics and Linguistic Theory (SALT) 20*:19-37, eds. Lutz, David, and Nan Li. Ithaca, NY: CLC Publications.
- Tieu, Lyn. 2013. *Logic and Grammar in Child Language: How Children Acquire the Semantics of Polarity Sensitivity*. Doctoral Dissertation, University of Connecticut.
- Tieu, Lyn. 2015. Input vs. output in the acquisition of negative polarity: The curious case of *any*. In *Language, Cognition, and Mind, Volume 1, Negation and Polarity: Experimental Perspectives*, 327-343, eds. Larrivière, Pierre, and Chungmin Lee. Springer.
- Tieu, Lyn, and Jeffrey Lidz. Under review. NPI licensing and beyond: Children's knowledge of the semantics of *any*.
- Van der Wal, Sjoukje. 1996. *Negative polarity items and negation: Tandem acquisition*. Doctoral Dissertation, University of Groningen, Groningen.
- Van der Wouden, Ton. 1994. Polarity and 'illogical negation'. *Dynamics, Polarity and Quantification* 17:16-45.
- Van der Wouden, Ton. 1997. *Negative contexts: collocation, polarity and multiple negation*. London: Routledge.
- Van Kampen, Nelly Jacqueline. 1994. The learnability of the left branch condition. *Linguistics in the Netherlands* 199:83-94.
- Van Rooy, Robert. 2003. Negative polarity items in questions: Strength as relevance. *Journal of Semantics* 20:239-273.
- Van Rooy, Robert, and Marie Šafářová. 2003. On polar questions. In *Proceedings of Semantics and Linguistic Theory (SALT) 13*:292-309. eds. Young, Rob, and Yu-Ping Zhou. Ithaca, NY: CLC Publications.
- Vinther, Thora. 2002. Elicited imitation: A brief overview. *International Journal of Applied Linguistics* 12:54-73.
- Von Stechow, Kai. 1999. NPI licensing, Strawson entailment, and context dependency. *Journal of Semantics* 16:97-148.
- Von Stechow, Kai, and Sabine Iatridou. 2003. Epistemic containment. *Linguistic Inquiry* 34:173-198.

- Wang, Li. 1943. *Zhongguo Xiandai Yufa* [Modern Grammar of Chinese]. Beijing: The Commercial Press.
- Wang, Flora Yu-Fang. 1993. The Chinese NPI *renhe* in contexts with negative values. In *Proceedings of Pacific Asia conference on formal and computational linguistics (PACFoCoL I)* 1:265-281, ed. Hsiao, E. Yu-Chao. The Computational Linguistics Society of ROC Taipei, Taiwan.
- Wang, Flora Yu-Fang, and Miao-Ling Hsieh. 1996. A syntactic study of the Chinese negative polarity item *renhe*. *Cahiers de linguistique-Asie orientale* 25:35-62.
- Wellman, Henry M., and David Estes. 1986. Early understanding of mental entities: A reexamination of childhood realism. *Child development* 57(4): 910-923.
- Wellman, Henry M., and Jacqueline D. Woolley. 1990. From simple desires to ordinary beliefs: The early development of everyday psychology. *Cognition* 35:245-275.
- Wells, Gordon. 1981. *Learning Through Interaction: The Study of Language Development*. Cambridge, UK: Cambridge University Press.
- Wijnen, Frank. 1988. Spontaneous word fragmentations in children: Evidence for the syllable as a unit in speech production. *Journal of Phonetics* 16(2):187-202.
- Wijnen, Frank. 1992. Incidental word and sound errors in young speakers. *Journal of Memory and Language* 31:734-755.
- Wijnen, Frank, and Gerard Bol. 1993. The escape from the optional infinitive stage. *Language and cognition* 3:105-118.
- Wilson, John, and Alison Henry. 1998. Parameter setting within a socially realistic linguistics. *Language in Society* 27:1-21.
- Wu, Jian-Xin. 1999. A minimal analysis of *dou*-quantification. Manuscript, University of Maryland College Park.
- Xiang, Ming, Brian Dillon, and Colin Phillips. 2009. Illusory licensing effects across dependency types: ERP evidence. *Brain and language* 108:40-55.
- Xie, Zhi-Guo. 2007. Nonveridicality and existential polarity wh-phrases in Mandarin. In *Proceedings of Chicago Linguistic Society (CLS)* 43(2):121-135, eds. Elliott, Malcolm, James Kirby, Osamu Sawada, Eleni Staraki, and Suwon Yoon. Chicago: University of Chicago Press.
- Zeijlstra, Hedde. 2011. On the syntactically complex status of negative indefinites. *Journal of comparative Germanic linguistics* 14:111-138.
- Zhou, Jing. 2004. The Zhou 1 corpus. *The CHILDES database*.
- Zhou, Jing. 2004. The Zhou 2 corpus. *The CHILDES database*.
- Zhou, Peng. 2011. Interface conditions in child language: A view from Mandarin Chinese. *Language Acquisition* 18:202-204.
- Zhou, Peng. 2010. *Interface conditions in child language: A view from Mandarin Chinese*. Doctoral Dissertation, Macquarie University.
- Zwarts, Frans. 1981. *Negatief polaire uitdrukkingen I* [Negative polarity expressions I]. *Glott* 4:35-132.

180 Acquiring Negative Polarity Items

- Zwarts, Frans. 1986. *Categoriale Grammatica En Algebraïsche Semantiek: Een Onderzoek Naar Negatie En Polariteit in Het Nederlands* [Categorical grammar and algebraic semantics: a study of negation and polarity in Dutch]. Doctoral Dissertation, University of Groningen, Groningen.
- Zwarts, Frans. 1995. Nonveridical contexts. *Linguistic Analysis* 25:286-312.
- Zwarts, Frans. 1998. Three types of polarity. In *Plurality and quantification*, 177-238, eds. Hamm, Fritz, and Erhard Hinrichs. Dordrecht: Kluwer Academic.

Appendices

Appendix A: *hoeven*'s distribution in adult Dutch (CGN) by licensing condition

Conditions	Count (percentage)
Licensed by <i>niet</i> 'not'	1274 (76.47%)
Licensed by a negative indefinite, i.e. <i>geen</i> 'no(ne)', <i>niks</i> 'nothing', etc.	227 (13.63%)
Licensed by weaker negation, i.e. <i>alleen</i> 'only', <i>weinig</i> 'few', etc.	164 (9.845%)
In contrastive contexts	13 (1.18%)
By means of self-correction	8 (0.47%)
Total	1666

Appendix B: *hoeven*'s distribution in child-directed Dutch (CHILDES) by licensing condition

Licensing condition	Count (percentage)
Sentential negation (<i>niet</i> 'not')	299 (80.81%)
Negative indefinites (<i>geen</i> 'no(ne)', <i>niks</i> 'nothing', etc.)	57 (15.41%)
Weaker negation (<i>alleen</i> 'only', <i>weinig</i> 'few', etc.)	14 (3.78%)
Total	370

Appendix C: Frequency of *hoeven* licensed by different negative indefinites in adult Dutch (CGN)

Negative indefinites	Count (percentage)
<i>geen</i> 'no(ne)'	114 (51.35%)
<i>niks</i> (<i>niets</i>) 'nothing'	73 (32.88%)
<i>niemand</i> 'nobody'	8 (3.6%)
<i>nooit</i> 'never'	18 (8.1%)
<i>nergens</i> 'nowhere'	9 (4.05%)
Total	222

Appendix D: Frequency of different weaker negative expressions in child Dutch development (CHILDES)

Weaker negative expressions	Age: <4	Age: 4-5
<i>weinig</i> 'few'	3	3
<i>niet iedereen</i> 'not everybody'	0	2
<i>niet alles</i> 'not everything'	1	1
<i>slechts</i> 'merely'	0	0
<i>alleen</i> 'only'	159	104
<i>pas</i> 'not until'	120	22

Appendix E: Distributional properties of co-occurrences of *hoeven* and various licensers in terms of distance in syllables in child-directed speech (CHILDES)

Licenser	Distance in syllables	Count
<i>niet</i> 'not'	0	122
	1	117
	2	34
	3	18
	>3	8
<i>geen</i> 'no(ne)'	0	18
	1	19
	2	1
	3	2
	>3	0
<i>niks (niets)</i> 'nothing'	0	5
	1	4
	2	2
	3	0
	>3	2
<i>maar</i> 'only'	0	2
	1	5
	2	0
	3	0
	>3	0
<i>alleen</i> 'only'	0	3
	1	1
	2	0
	3	0
	>3	0
<i>nooit</i> 'never'	0	0
	1	1
	2	1
	3	0
	>3	2
Other licensers	---	3
Total	---	370

Appendix F: Co-occurrence frequency of *hoeven* with various licensers within a distance of 3 syllables in child-directed Dutch (CHILDES)

Licenser	Count
<i>niet</i> 'not'	291
<i>geen</i> 'no(ne)'	40
<i>niks (niets)</i> 'nothing'	11
<i>maar</i> 'only'	7
<i>alleen</i> 'only'	4
<i>nooit</i> 'never'	2
other licensers	3
Total	358

Appendix G: Total hours of recording and total amount of utterances in child-directed Dutch (CHILDES)

Database	Hours of recording	Amount of utterances
BolKuiken (Bol and Kuiken 1990)	47	13,966
Groningen (Wijnen and Bol 1993)	170	180,929
VanKampen (Van Kampen 1994)	91.5	58,587
Wijnen (Elbers and Wijnen 1992; Wijnen 1988, 1992)	723	11,751
Total	331.5	265,233

Appendix H: Design of the Dutch experiment

Condition	Grammaticality	Licenser	Number of stimuli
Test	Grammatical	<i>niet</i> 'not'	4
		<i>geen</i> 'no(ne)'	2
		<i>niemand</i> 'nobody'	2
		<i>weinig</i> 'few'	2
	Ungrammatical	absent	4
Filler	Grammatical	N.A.	6
	Grammatical with <i>willen</i> 'will'	N.A.	6
	Grammatical with <i>kunnen</i> 'can'	N.A.	4
	Ungrammatical ¹	N.A.	4
Trails	Grammatical	N.A.	4
Total			40

Appendix I: Shenme appearing in different licensing contexts

- (1) under the scope of a negative marker

Ta mei you shenme hua xiang he ni shuo.
 s/he NEG have *shenme* word want with you say
 'S/he does not want to say anything to you.'

- (2) in a restrictive clause of a universal quantifier

Ta shenme hua dou xiang he ni shuo.
 s/he *shenme* word all want with you say
 'S/he wants to tell you everything.'

¹ Four ungrammatical fillers were included to examine whether our participants were behaving as target-like in the elicited imitation task – namely that they were unconsciously reconstructing the stimuli by establishing their own mental representation of the stimuli but not repeating the stimuli from memory alone – though we already controlled for the length of the stimuli. The ungrammatical fillers all contained a syntactic error due to a non-application of the V2 rule in Dutch main clauses, since children have already acquired that a finite verb must be moved to the second sentence position in a main clause as early as 2;06 (cf. De Haan 1986). An ungrammatical stimulus is presented below.

* Gisteren Sam met King in het Vondelpark wandelede.
 yesterday Sam with King in the Vondelpark walked
 Intended: 'Yesterday, Sam walked in the Vondel park with King.'

(3) in a conditional clause

Ruguo ta you shenme hua xiang he ni shuo,
 if s/he have *shenme* word want with you say
 ta jiu hui gei ni dadianhua.
 s/he then will to you call
 'If s/he has something to tell you, s/he will then call you.'

(4) in a *before*-clause

Zaita xiangdao shenmefangfa zhiqian,
 at s/he think of *shenme*solution before
 yinggai he ni haohao shangliang yixia.
 should withyou well discuss while
 'Before s/he thinks of any solution, s/he should have a good talk with you.'

(5) in a donkey sentence

Ta shuo shenmewo jiu zuo shenme.
 s/he say *shenme* then do *shenme*
 'Whatever s/he says, I will do.'

(6) in a matrix interrogative sentence

Ta he ni shuo guo shenme (ne)?
 s/he with you say PERF *shenme* Q-marker
 'What did s/he tell you?'

(7) in an embedded interrogative sentence

Wo xiang zhidao ta he ni shuo guo shenme.
 I want know s/he with you say PERF *shenme*
 'I want to know what s/he told you'

(8) imperfectives: futural aspect

Wo mingtian qu shichang gei woma mai dian shenme chi de.
 I tomorrow go market for I mum buy CL *shenme* eat PAR
 'I will go to the market tomorrow to buy something to eat for my mother.'

(9) imperfectives: habitual aspect

Ta zongshibaoyuan shenme buhao shenme budui.
 s/he always complain *shenme* bad *shenme* wrong
 'S/he always complains that something is wrong.'

(10) imperfectives: progressive aspect

Ta xianzai zhengzai kan shenme dianshiju ne.
 s/he now PROG watch *shenme* television program PAR
 'S/he is now watching a television program.'

186 Acquiring Negative Polarity Items

(11) in an imperative

Kuai qu mai dian shenme zhixue de yao!
 quickly go buy CL *shenme* haemostatic MOD medicine
 'Quickly go buy some haemostatic medicine!'

(12) in a modal context

Ta haoxiang zaikan shenme dianshi jiemu.
 s/he probably at watch *shenme* television program
 'S/he is probably watching some television program.'

(13) in a matrix polar question

Ni hai xiang mai shenme yao ma?
 you still want buy *shenme* medicine Q-marker
 'Do you still want to buy some/any medicine?'

(14) in an embedded polar question

Wo tebie xiang zhidao ta shifou gei wo mai le
 I very want know s/he whether for I buy PERF
 shenme liwu.
shenme present
 'I really want to know whether s/he has bought me a present.'

(15) in a complement clause of a non-factive verb

Wo cai ta yijing gei ni mai le shenme liwu.
 I guess s/he already for you buy PERF *shenme* present
 'I guess that s/he has already bought you a present.'

(16) under the scope of inference *le*

Shenme lingjian er huai le.
shenme spare part broken INF-LE
 'Some part appears to be broken.'

Appendix J: Distribution of *Shenme* in child-directed Mandarin (CHILDES)

Semantic contexts	Count (%)
In <i>wh</i> -questions	976 (97.7%)
In the restriction of universals	2 (0.2%)
In (bare) conditional clauses	3 (0.3%)
In polar questions	3 (0.3%)
In imperfectives	9 (0.9%)
In imperatives	2 (0.4%)
In epistemic uncertainty contexts	4 (0.4%)
Total	999

Appendix K: Frequency of different licensers or licensing conditions for *shenme* in child language (CHILDES)²

Licensers or licensing contexts for <i>shenme</i>	Age<4 years	Age>4 years
<i>bu</i> 'not'	1009	890
<i>mei</i> 'not'	471	617
<i>dou</i> 'all'	122	126
Epistemic modal adverbs	56	26
Non-factive predicates	201	162
Imperfective aspects	>50	>50
Imperatives	>50	>50
Polar questions	>50	>50
<i>Before</i> -clauses	>50	>50
Conditional clauses	>50	>50

Appendix L: Design of the Mandarin experiment

Experimental conditions	Number of stimuli
<i>Wh</i> -questions	4
Negative contexts introduced by a sentential negation	4
Conditional clauses	4
Epistemic uncertainty contexts introduced by a modal adverb	4
Polar questions	4
Unlicensed test condition: perfect tense	4
Grammatical filler condition	14
Ungrammatical filler condition (with word order error of <i>dou</i>)	4
Trials	4
Total	46

Appendix M: Examples of test and filler stimuli per condition

(1) *wh*-questions

Weinixiong wen Xiaozhu: “Xiaoguanzi li you
 Winnie the Pooh ask Piglet little jar inside have
 shenme haochi-de ne?”
shenme delicious-ADJ Q-marker
 ‘Winnie the Pooh asks Piglet: “What is there in the little jar that is
 delicious?”’

² Not all licensers or licensing conditions for *shenme* can be automatically tracked for their frequency in child language speech. Therefore, some licensing contexts were manually analysed for frequency, for which a maximum value of 50 was employed. Thus, ‘>50’ in the table means that the frequency of the relevant licensing context is at least 50.

188 Acquiring Negative Polarity Items

- (2) negative contexts introduced by a sentential negation

Xiaozhu he ta-de pengyou-men jintian shenme
Piglet with he/she-GEN friend-PL today *shenme*
zuoye ye bu yong zuo.
homework even not need do
'Piglet and her friends do not need to do any homework today.'

- (3) conditional clauses

Buguan Weinixiong you shenme mafan, pengyou-men
regardless of Winnie the Pooh have *shenme* trouble friend-PL
dou hui qu bangmang.
all will go help
'Whatever trouble Winnie the Pooh has, (his) friends are willing to help.'

- (4) epistemic uncertainty contexts introduced by an epistemic modal adverb

Tiaotiaohu he Weinixiong keneng zhengzai kan
Tiger with Winnie the Pooh possibly PROG read
shenme gushi shu.
shenme story book
'Tiger and Winnie the Pooh are possibly reading a storybook.'

- (5) polar questions

Xiaozhu dui Weinixiong shuo: "Xiangzi li hai you
Piglet to Winnie the Pooh say suitcase inside still have
shenme binggan me?"
shenme biscuit Q-marker
'Piglet says to Winnie the Pooh: "Are there still any biscuits in the suitcase?"'

- (6) the unlicensed condition: perfect tense

* Weinixiong zuotian xiaowu mai-le shenme
Winnie the Pooh yesterday afternoon buy-PERF *shenme*
da nangua song gei Xiaozhu.
big pumpkin send for Piglet
Intended: 'Winnie the Pooh bought a big pumpkin for Piglet yesterday afternoon.'

- (7) grammatical fillers

Weinixiong zuotian dai pengyou-men qu canjia-le
Winnie the Pooh yesterday take friend-PL go participate-PERF
yi-ge shengrihui.
one-CL birthday party
'Winnie the Pooh took his friends to a birthday party yesterday.'

- (8) ungrammatical fillers: with post-positioned restriction of *dou* 'all'
 * Meici xiaxue de shihou, dou Tiaotiaohu he pengyou-men
 every time snow REL while all Tiger with friend-PL
 dui xueren.
 build snowman
 Intended: 'Every time it snows, Tiger builds a snowman with his friends.'

Appendix N: Examples of different categories of licensing status attested in child language development (CHILDES)³

- (1) Licensed NPIs:
 xx *hoef* geen suiker.
 xx need no sugar
 'xx does not need sugar.'
 (Wijnen and Bol 1993: abe21000.cha: line 24)
- (2) Unlicensed NPIs:
 Ik *hoef* drinken.
 I need drink
 'I want to drink something.'
 (Wijnen and Bol 1993: mat30113.cha: line 515)
- (3) Self-correction:
 Deze *hoe(ft)* deze moet ə op.
 this need(s) this should ə on
 'This needs, this should be here.'
 (Wijnen and Bol 1993: daa20910.cha: line 436)
- (4) Unclear situation:
 (I)k *hoef* ...
 I need
 'I need ...'
 (Wijnen and Bol 1993: jos30110.cha: line 1275)

³ Since our Dutch results contained all the defined categories, we choose to present here examples from Dutch.

Appendix O: *Hoeven* in adult Dutch and child-directed Dutch

Licensing condition	CGN	CHILDES
In the scope of sentential negation	1274 (76.5%)	299 (80.8%)
In the scope of negative indefinites	227 (13.6%)	57 (15.4%)
In the scope of NEG-DE licensers	164 (9.9%)	14 (3.8%)
In contrastive contexts	13 (1.2%)	0
Others	8 ⁴ (0.5%)	0
Total	1666	370

Appendix P: *Any* in adult English and child-directed English (based on approximately 1000 randomly selected utterances)

Licensing condition	BNC	CHILDES
In the scope of sentential negation	461 ⁵ (44.1%)	600 (57.6%)
In (embedded) polar questions	245 (23.5%)	336 ⁶ (32.3%)
In subtriggering or epistemic modal contexts	178 (17.8%)	38 (3.7%)
In conditional clauses	76 (7.6%)	32 (3.1%)
In the scope of <i>without</i>	17 (1.6%)	3 (0.3%)
In the scope of negative indefinites	34 (3.6%)	12 (1.2%)
In the scope of semi-negative expressions	7 (1.6)	7 (0.7%)
In the scope of <i>only</i>	9 (0.9%)	0
In <i>before</i> -clauses	6 (0.6%)	7 (0.7%)
In (embedded) <i>wh</i> -interrogatives	3 (0.3%)	5 ⁷ (0.5%)
In the complement of emotive verbs	2 (0.2%)	0
In the restriction of a universal quantifier	1 (0.1%)	0
Others ⁸	4 (0.4%)	0
Total	1043	1040

⁴ All these eight instances are defined as instances of *self-correction*. An example of *self-correction* is given in Appendix N.

⁵ This figure covers 12 utterances containing *any* licensed by negative verbs such as *lack* or *refuse*, or negative adjectives such as *impossible* or *unlikely*.

⁶ Among these 336 utterances, there are 36 instances containing *any* in embedded polar questions.

⁷ Two of these instances were embedded *wh*-interrogatives.

⁸ This category includes four cases of *self-correction*, for which an example is given below.

John got any, some interesting stuff to read.

Appendix Q: *Shenme* in adult Mandarin and child-directed Mandarin (based on approximately 1000 randomly selected utterances)

Licensing condition	PKU	CHILDES
In <i>wh</i> -interrogatives as a question word	722 (64.1%)	976 (97.7%)
In the scope of sentential negation	110 (9.8%)	0
In the restriction of a universal quantifier	86 (7.7%)	2 (0.2%)
In conditional clauses	47 (4.2%)	0
In imperfective aspects	46 (4.1%)	6 (0.6%)
In donkey constructions	26 (2.3%)	6 (0.6%)
In epistemic/inferential/subjunctive/ modal contexts	36 (3.2%)	4 (0.4%)
In polar questions (incl. X-NEG-X questions)	37 (3.3%)	3 (0.3%)
In imperatives	7 (0.6%)	2 (0.2%)
In <i>wh</i> -interrogatives with a non- <i>wh</i> interpretation ⁹	6 (0.5%)	0
In veridical contexts	1 (0.1%)	0
In the scope of a negative indefinite	1 (0.1%)	0
In other minimally negative contexts	0	0
Unclear	1 (0.1%)	0
Total	1126	999

⁹ An example of *shenme* appearing in a question without a *wh*-interpretation is given below.

Duoshao qian cai neng zuo dian shenme maimai (ne)?
 how much money then able do CL *shenme* business Q-marker
 'How much money do we need to start some business?'

192 Acquiring Negative Polarity Items

Appendix R: Replies to polar questions containing any uttered by children below the age of four (CHILDES)

Answers	Category	Count (percentage)
Positive	Direct yes given by the parent/investigator	11 (11.5%)
	A positive bias indicated by the child her/himself	5 (5.2%)
	An indirect positive answer given by the parent/investigator	1 (1%)
	A positive answer with counterevidence marked by <i>well</i> , etc.	12 (12.5%)
Negative	Direct <i>no</i> given by the parent/investigator	26 (27.1%)
	A negative bias indicated by the child her/himself	15 (15.6%)
	An indirect negative answer given by the parent/investigator	10 (10.4%)
	An indirect negative answer introduced by <i>I don't think/see</i>	7 (7.3%)
	<i>I don't know</i>	1 (1%)
Unclear	No bias or answers can be derived	8 (8.3%)
Total		96

Appendix S: Replies to polar questions without any uttered by children below the age of four (CHILDES)

Answers	Category	Count (percentage)
Positive	Direct yes given by the parent/investigator	42 (40.8%)
	A positive bias indicated by the child her/himself	6 (5.9%)
	An indirect positive answer given by the parent/investigator	16 (15.5%)
	A positive answer with counterevidence marked by <i>well</i> , etc.	10 (9.7%)
Negative	Direct <i>no</i> given by the parent/investigator	10 (9.7%)
	A negative bias indicated by the child her/himself	1 (0.9%)
	An indirect negative answer given by the parent/investigator	5 (4.6%)
	An indirect negative answer introduced by <i>I don't think/see</i>	0
	<i>I don't know</i>	3 (2.9%)
Unclear	No bias or answers can be derived	10 (9.7%)
Total		103

Appendix T: Frequency of different *hoeven*-licensors in child Dutch development (CHILDES)

<i>Hoeven</i>-licensors	Age: <4	Age: 4–5
<i>geen</i> 'no(ne)'	285	108
<i>niks (niets)</i> 'nothing'	202	52
<i>niemand</i> 'nobody'	23	4
<i>nooit</i> 'never'	9	18
<i>nergens</i> 'nowhere'	0	0
<i>weinig</i> 'few'	3	3
<i>niet iedereen</i> 'not everybody'	0	2
<i>niet alles</i> 'not everything'	1	1
<i>slechts</i> 'merely'	0	0
<i>alleen</i> 'only'	159	104
<i>pas</i> 'not until'	120	22

Appendix U: Frequency of different *any*-licensors in child English development (CHILDES)

<i>Any</i>-licensors	Age: <4	Age: 4–5
<i>no</i>	37873	2689
<i>nothing</i>	377	80
<i>nobody</i>	164	8
<i>nowhere</i>	14	7
<i>few</i>	35	9
<i>only</i>	281	186
Conditional clauses	286	412

Appendix V: Distribution of the NPIs in child language by licensing status (CHILDES)

	Group 1 (1- and 2-year-olds)		
	Dutch	English	Mandarin
Licensed	107 (92.5%)	317 (98.4%)	55 (100%)
Unlicensed	1 (0.9%)	2 (0.6%)	0
Self-correction	2 (1.7%)	0	0
Unclear situation	3 (2.6%)	3 (1%)	0
Others	4 (3.4%)	0	0
Total	117	322	55
	Group 2 (3-year-olds)		
	Dutch	English	Mandarin
Licensed	72 (88.8%)	192 (100%)	176 (99.4%)
Unlicensed	1 (1.2%)	0	0
Self-correction	1 (1.2%)	0	0
Unclear situation	4 (4.9%)	0	1 (0.6%)
Others	3 (3.7%)	0	0
Total	81	192	177
	Group 3 (4-year-olds)		
	Dutch	English	Mandarin
Licensed	49 (96.1%)	140 (100%)	381 (100%)
Unlicensed	0	0	0
Self-correction	1 (1.9%)	0	0
Unclear situation	1 (1.9%)	0	0
Others	0	0	0
Total	51	140	381

Appendix W: Distribution of the NPIs in child language by licensing environments (CHILDES)

	Group 1 (1- and 2-year-olds)		
	Dutch	English	Mandarin
Anti-Morphic	101 (99%)	248 (78.2%)	1 (1.8%)
Anti-Morphic, but not Anti-Additive	1 (1%)	2 (0.6%)	0
Downward Entailing, but not Anti-Additive	0	0	1 (1.8%)
<i>Wh</i> -questions	0	7 (2.2%)	53 (96.4%)
Polar questions	0	60 (18.9%)	0
Other nonverdicial	0	0	0
Total	102	317	55
	Group 2 (3-year-olds)		
	Dutch	English	Mandarin
Anti-Morphic	67 (98.5%)	152 (79.2%)	5 (2.8%)
Anti-Morphic, but not Anti-Additive	0	3 (1.6%)	0
Downward Entailing, but not Anti-Additive	1 (1.5%)	0	1 (0.6%)
<i>Wh</i> -questions	0	1 (0.5%)	170 (96.6%)
Polar questions	0	36 (18.8%)	0
Other nonverdicial	0	0	0
Total	68	192	176
	Group 3 (4-year-olds)		
	Dutch	English	Mandarin
Anti-Morphic	42 (85.7%)	107 (76.4%)	15 (3.9%)
Anti-Morphic, but not Anti-Additive	5 (10%)	0	0
Downward Entailing, but not Anti-Additive	2 (4%)	7 (5%)	1 (0.3%)
<i>Wh</i> -questions	0	1 (0.7%)	335 (87.9%)
Polar questions	0	25 (17.9%)	0
Other nonverdicial	0	0	30 (7.9%)
Total	49	140	381

196 Acquiring Negative Polarity Items

Summary: Acquiring Negative Polarity Items

Negative Polarity Items (NPIs) are words or expressions that can only survive in certain negative contexts (Ladusaw 1979). The English adverb *yet* is an NPI: it is fine to say *Max has not come yet*, but *Max has come yet* is judged deviant. Another example is the idiomatic expression *to lift a finger*, which also requires a proper negative context for grammatical status: *Nobody lifted a finger to help* is fine, but *Mary lifted a finger to help* is ungrammatical.

The literature so far has been investigating different research questions within the study of NPIs, concerning the attested cross-linguistic variation of NPIs (Giannakidou 2011; Haspelmath 1997), the different syntactic and semantic categories that can form NPIs (Hoeksema 1994; Israel 1996; Van der Wouden 1994), the descriptive characteristics of a proper licenser for NPIs (Fauconnier 1975, 1978; Ladusaw 1979), and the taxonomy of NPIs in terms of strengths depending on the types of negative contexts that may and may not license them (Van der Wouden 1994; Zwarts 1986, 1998).

This dissertation investigates a different topic than those mentioned above: the acquisition of NPIs. Acquisition of NPIs has attracted little attention from scholars since the study of NPIs has been established. The few studies that address this research topic are restricted to English *any* (Tieu 2010, 2013), Dutch *hoeven* 'need' and *meer* 'more' (Koster and Van der Wal 1996; Van der Wal 1996), and Mandarin Chinese *renhe* 'any' (Huang and Crain 2014b). The small amount of research on NPI acquisition calls for more exploration of this aspect.

Another reason for investigating NPIs from a perspective of language acquisition lies in the learnability problem raised by the existence of NPIs in natural languages. Language acquisition proceeds on the basis of positive evidence only, which is language input containing grammatical utterances in a target language (cf. Marcus 1993; Pinker 1984, 1995). This means that children only receive "good" sentences like *Max has not come yet* or *Nobody lifted a finger to help* while acquiring the corresponding NPIs, but they are never confronted with "bad" sentences like *Max has come yet* or *Mary lifted a finger to help*. The "bad" sentences, which contain unlicensed NPIs, are ungrammatical and hence absent in the language input. However, this reasoning does not hold the other way around: absence of certain constructions does not necessarily indicate that they are ungrammatical. How, then, are children able to detect the restricted distributions of NPIs based on positive evidence only?

Moreover, investigating how NPIs are acquired can help us understand why NPIs have become NPIs. The reasoning here is straightforward: how we eventually analyse the language we speak is a result of how we have acquired it. Therefore, investigating the learning

198 Acquiring Negative Polarity Items

process in language development can provide insights into how grammar is represented in our mind. In the context of NPIs, this means that analysing the acquisition of NPIs can tell us how NPIs may be represented in different developmental phases. Investigating NPI acquisition can thus shed light on the question of why NPIs are actually NPIs.

To investigate NPIs from a perspective of language acquisition, three research questions are posed and addressed in this dissertation.

Q1: What kind of learning mechanism(s) do children employ in their acquisition of NPIs?

Q2: What possible learning pathway(s) can be attested in the acquisition of NPIs?

Q3: What does acquisition of NPIs tell us about the nature of NPIs?

These questions are addressed by analysing the acquisition of three NPIs, taken from different languages. They are Dutch *hoeven* 'need', English *any*, and Mandarin Chinese *shenme* 'a/some'. The selection of these NPIs as the targets of investigation in this dissertation is motivated by a number of reasons. One is that these NPIs are all very frequently attested in child language; even two-year-olds are already able to use these NPIs. This does not only guarantee a sufficient amount of corpus data for statistical analysis, but also ensures that this dissertation is not investigating some words that are unfamiliar or even unknown from a child's perspective.

Another reason for selecting *hoeven*, *any* and *shenme* involves their different polarity strengths. As already mentioned, NPIs can be divided into different strengths, depending on the types of negative contexts that may and may not license them (cf. Zwarts 1986, 1998). Whereas English *any* is a *weak* NPI, licensed in so-called *Downward Entailing* environments (cf. Ladusaw 1979), Dutch *hoeven* and Mandarin *shenme* exhibit a stronger and a weaker strength, respectively, compared to *any*. *Hoeven* is dubbed a *strong/weak* NPI, which is restricted to merely some, but crucially not all, Downward Entailing environments (for instance, it occurs in the scope of a sentential negation or a negative indefinite, but not in conditional clauses or in the restriction of a universal quantifier). *Shenme*, on the other hand, is categorised as a *superweak* NPI, due to its distribution in a superset of the set of Downward Entailing contexts: so-called *nonveridical* environments (cf. Giannakidou 1997; Zwarts 1995). Selecting NPIs of various strengths is crucial in understanding possible universal learning strategies and/or acquisitional patterns of different NPIs, especially when investigating whether NPIs of different strengths may share one and the same reason underlying their NPI-hood.

A third reason why *hoeven*, *any* and *shenme* are selected is that they are taken from different languages. Since the phenomenon of NPIs is cross-linguistically attested, a cross-linguistic – though small – sample of

NPIs can provide a relatively representative overview of NPI acquisition in general.

In order to answer research questions Q1 (what are possible learning mechanism(s)) and Q2 (what are possible learning pathway(s)), the acquisition of the three selected NPIs is investigated by means of corpus research (in the case of Dutch *hoeven*, English *any* and Mandarin *shenme*) and experimental studies (in the case of Dutch *hoeven* and Mandarin *shenme*). As for research question Q3, which is aimed at exploring the reason(s) underlying NPI-hood, the analysis of each of the selected NPIs emerged during the acquisitional process is investigated. This is done by hypothesising an underlying analysis or representation of the NPIs, based on their distributional patterns attested in late child language, but also by taking into consideration how the NPIs have developed into these distributions, given their distributional patterns attested in early child language.

The acquisition of the Dutch NPI *hoeven* 'need' is first explored in a corpus study, which is presented in Chapter II. In particular, the distribution of this NPI in child Dutch development is analysed in the CHILDES database (MacWhinney 2009). Corpus results suggest two developmental stages in the acquisition of the Dutch NPI. In the initial stage, when children are under age four, the NPI *hoeven* is only attested in the scope of the sentential negative marker *niet* 'not'; in the subsequent stage, however, *hoeven* is also attested in the scope of a negative indefinite, such as *niks* 'nothing' or *geen* 'no(ne)'. Given this two-stage development, the following acquisitional process is hypothesised. Since in the language input the NPI *hoeven* is attested in the scope of the sentential negative marker *niet* more than 80% of the time, it is very likely that Dutch-acquiring children start with an assumption that *hoeven* bears a lexical dependency with *niet*, which may be represented as [HOEVEN NIET] in the early child grammar. Later on, when confronted with, or able to analyse more input data, children are hypothesised to update their analysis of the NPI according to the input evidence, to explain as much input as possible. But what is the updated analysis of the NPI in late child Dutch?

In order to explore how older Dutch children may analyse the NPI *hoeven*, Chapter II adopts the decomposable analysis of negative indefinites proposed by Jacobs (1980). In Jacobs' view, negative indefinites in languages such as German contain, on the one hand, an abstract negation, and, on the other hand, an existential quantifier. Transferring this decomposable analysis to Dutch (see also Penka and Zeijlstra 2005), Chapter II argues that Dutch children reanalyse *hoeven* as having a lexical dependency with an abstract negation NEG, which can be spelled-out as the sentential negative marker *niet*, or the abstract negation that is incorporated in negative indefinites. This reanalysis, which can be represented as [HOEVEN NEG] in the late child grammar, not only explains *hoeven*'s occurrence in the scope of the sentential negation *niet*, but also its appearance with a negative indefinite.

200 Acquiring Negative Polarity Items

Moreover, since the abstract negation NEG can also be analysed as being incorporated in Downward Entailing contexts such as those introduced by *weinig* 'few' or *alleen* 'only' (cf. Iatridou and Zeijlstra 2013; Penka and Zeijlstra 2005), but, crucially, not in conditional clauses or in the restriction of a universal quantifier, the reanalysis gives rise to a distributional pattern of Dutch *hoeven* as a strong/weak NPI, which is restricted to some, but crucially not all, Downward Entailing contexts – precisely as is observed in adult language use.

The learning process in which Dutch children start with [HOEVEN NIET] and later make the reanalysis [HOEVEN NEG] is further examined from an experimental perspective. An elicited imitation task, which assesses Dutch children's knowledge of the NPI appearing in six different (non-)licensing conditions, is reported in Chapter III. The experiment manipulates *hoeven*'s occurrence in six different contexts, of which five represent grammatical licensing conditions (in the scope of *niet* 'not', *geen* 'no(ne)', *niemand* 'nobody', *weinig* 'few' and *alleen* 'only') and one involves the ungrammatically used NPI (in simple affirmative contexts). Data collected from 132 monolingual Dutch children (2;09–5;10; mean=4;04; SD=9.3 months) present evidence for the acquisitional pathway attested in the corpus study. Moreover, the learning path from [HOEVEN NIET] to [HOEVEN NEG] is fine-tuned by the experimental results. Three-year-olds appear to have established a second lexical frame [HOEVEN GEEN] in addition to [HOEVEN NIET], since their experimental performance in the licensing condition by *niet* is as good as that in the licensing condition by *geen*. Based on both the corpus and the experimental findings, it is concluded that the acquisition of the Dutch NPI *hoeven* exhibits two stages: a lexical stage before the age of four, in which the child grammar consists of two lexical frames [HOEVEN NIET] and [HOEVEN GEEN], and an abstract stage shortly after age four, in which the child grammar merely contains a single abstract analysis [HOEVEN NEG].

The acquisition of the Mandarin NPI *shenme* 'a/some' is explored in both corpus research, which is reported in Chapter IV, and an experiment with an elicited imitation task, which is presented in Chapter V. Since the literature thus far does not provide a systematic and quantitative overview of how this Mandarin NPI is distributed, before investigating the distribution of the Mandarin NPI *shenme* in CHILDES, chapter IV first analyses the distribution of this in naturalistic adult speech. Data collected in adult Mandarin show that *shenme*, although it is most frequently attested in *wh*-questions, also appears in other nonveridical environments, such as in the scope of a sentential negation, in conditional clauses, in polar questions and in epistemic uncertainty contexts. But, crucially, *shenme* is never attested in veridical contexts. Given its restricted distribution as described above, this chapter proposes a unified approach that *shenme* is an NPI of the superweak strength, surviving in the whole array of nonveridical contexts. Adopting Giannakidou's approach to some Greek NPIs (2002, 2011), Chapter IV explains *shenme*'s NPI-status as a consequence of its non-referentiality. Suffering from its referential deficiency, *shenme* can only

appear in nonveridical environments because only there it is not forced to refer (Giannakidou 2010, 2011).

With respect to the acquisition of this Mandarin NPI, data collected in CHILDES turn out to suggest two developmental stages. In the initial stage, children analyse *shenme* as a mere question word, which explains why younger children only use *shenme* in *wh*-questions, but not in other nonveridical environments. This is explained by the fact that in the language input, *shenme* is used as a question word more than 97% of the time. In the subsequent stage, which is shortly after the age of four, however, a reanalysis seems to be established. Children no longer consider *shenme* as a mere question word, but rather a superweak NPI, which survives in the whole array of nonveridical contexts, including *wh*-questions. This reanalysis is argued to be triggered by input evidence as well – under the assumption that children have acquired the knowledge of *nonveridicality*.

The above-reported corpus findings with respect to the acquisition of the Mandarin NPI are further examined in an experiment with an elicited imitation design, reported in Chapter V. In order to examine the exact range of children's knowledge of the licensing of the NPI, the experiment manipulates six different test conditions. These conditions are (i) negative contexts introduced by a sentential negation, (ii) conditional clauses, (iii) epistemic uncertainty contexts introduced by modal adverbs such as *keneng* 'probably', (iv) polar questions, (v) *wh*-questions, and (vi) an unlicensed test condition by placing *shenme* in the perfect tense.

Data obtained from 88 monolingual Mandarin children (age range: 2;11–4;09; mean=3;11; SD=6 months) show that as early as two years old Mandarin children already exhibit target-like performance in the test condition of *wh*-questions, whereas in the other four grammatical test conditions target-like performance only seems to emerge with late three-year-olds. These results strongly suggest that the acquisition of the NPI has two stages, representing an early and a late child grammar of *shenme*, respectively. Whereas the early grammar consists of a concrete analysis of *shenme* as a question word, the late grammar contains an abstract NPI-analysis instead. This provides evidence for the corpus findings reported in Chapter IV. It is therefore concluded that Mandarin children are able to detect NPIs' distributional constraint even in the absence of negative evidence: they start with a strict assumption that *shenme* is merely a question word, and switch to a less strict analysis that *shenme* is a superweak NPI later on.

The acquisition of the English NPI *any* is explored by means of a corpus study in the CHILDES database, which is reported in Chapter VI. Similar to what has been reported on the acquisition of the Dutch and the Mandarin NPI in Chapter II to V, the acquisition of the English NPI *any* also turns out to have two developmental stages. Before age four, English-acquiring children seem to almost always utter the NPI in the scope of the sentential negation *not*, or in polar questions with a presumably negative bias. In late child language, however, the distribution of the English NPI is extended. Instead of under the scope of *not* or in negatively biased polar

202 Acquiring Negative Polarity Items

questions, children older than the age of four also use *any* in other Downward Entailing contexts such as in the scope of a negative indefinite, or in conditional clauses.

In order to explain the attested distributions in early and late child English, Chapter VI hypothesises a learning process that can be described as follows. In the initial stage, English children analyse the NPI *any* as bearing an immediate scopal relation with a sentential negation, which is realised either as *not* in a canonical negative sentence, or as a logic negation in a negatively biased polar question. This initial attempt to analyse the English NPI is triggered by input evidence, since in the input *any* is licensed by the sentential negation *not* around 58% of the time, and appears in polar questions approximately 33% of time. The polar questions in which *any* is attested in the language input do not always express a negative bias. However, the fact that at least 80% of the polar questions containing the NPI uttered by English two- and three-year-olds are negatively biased may suggest that younger children interpret those polar questions in which *any* is attested in the input as containing a negative bias.

The initial analysis that *any* must stay within the immediate scope of a sentential negation cannot explain *any*'s appearance in Downward Entailing contexts, like in the scope of a negative indefinite, or in conditional clauses. Thus, while confronted with input evidence that cannot be accounted for by their strict initial analysis, English-acquiring children need to make a reanalysis of the NPI. The restricted distribution of *any* to various Downward Entailing contexts in the input triggers children to hypothesise that the NPI must be exhaustified. This leads to the assumption of an abstract exhaustification operator, which applies to every Downward Entailing utterance containing *any* in the language input. To make the application of the exhaustification operator to the utterances containing *any* obligatory in late child grammar, Chapter VI follows Chierchia (2004, 2006, 2013) to hypothesise that *any* bears a σ -feature that obligatorily introduces domain alternatives, and that requires feature checking by an exhaustification operator. To conclude, English children start with the analysis that *any* bears an immediate scopal relation with the sentential negation, and reanalyse the NPI as carrying a σ -feature itself, which triggers the presence of a covert exhaustifier.

Based on what has been found and reported on the acquisition of the three NPIs in corpus and experimental studies, the three research questions are answered as follows. With respect to the research question Q1, which addresses the possible learning mechanism(s) that children may employ in their acquisition of NPIs in the absence of negative evidence, the current cross-linguistic investigation shows that a *conservative widening learning strategy* solves the learnability problem (cf. Manzini and Wexler 1987; Snyder 2008; Van der Wal 1996). The acquisition of the three investigated NPIs – which differ in their syntactic categories and polarity strengths – all shows a two-stage development. Children from different linguistic backgrounds (i.e. Dutch, English, and Mandarin) all start with a

narrow assumption of the selected NPIs. This initial step is triggered by input evidence. In the subsequent stage, when confronted with, or able to analyse and process more input data that falsify the initial narrow assumption, children establish a less narrow analysis of the NPIs.

As for the research question Q2, which aims to find out possible learning pathway(s) during the acquisition of NPIs, both the corpus and the experimental results obtained in this dissertation lead to the following conclusions. First, no universal learning pattern exists for NPIs (as opposed to what was assumed in Van der Wal 1996). Second, depending on the distributional properties of different NPIs and the semantic properties underlying possible licensing contexts for these NPIs, acquisition of different NPIs is found to exhibit distinct patterns.

The fact that different NPIs exhibit distinct acquisitional patterns moreover leads to the conclusion that different NPIs have become NPIs due to very different reasons – an answer to the research question Q3: what acquisition can tell us about the nature of NPIs. These distinct learning paths call for distinct explanations for the possible learning processes. As for Dutch *hoeven*, the results of both corpus and experimental studies suggest that Dutch children eventually establish a lexical association between the NPI on the one hand, and an abstract negation NEG on the other. By adopting Postal's approach to NPI-hood (Postal 2000; see also Collins and Postal 2014), it is further hypothesised that *hoeven* is represented as [HOEVEN NEG] in the learners' mental lexicon at the late stage of the acquisition. This means Dutch *hoeven* has become an NPI due to its lexical connection with an abstract negative form NEG. However, the English NPI *any* does not seem to share the same underlying analysis. The results collected from spontaneous child speech turn out to support the hypothesis that English four-year-olds assign a σ -feature to the NPI, which forces it to appear only in those contexts in which exhaustification does not give rise to a logical contradiction (cf. Chierchia 2004, 2006, 2013). This means that *any* has gained its polarity sensitivity because it bears a σ -feature, and therefore must be exhaustified. As for the Mandarin NPI, finally, the corpus and experimental results show that at least Mandarin four-year-olds are already able to license the NPI in the whole array of nonveridical environments, which are contexts that do not require the existence of a referent. The analysis that is assumed to explain such a wide distributional pattern of *shenme* in late child Mandarin is that *shenme* contains a dependent variable, which makes it referentially deficient and hence restricted by nonveridicality (cf. Giannakidou 2002, 2010, 2011).

The acquisitional exploration provides evidence that NPIs of different syntactic categories, polarity strengths, and from different language backgrounds have become NPIs due to different reasons. There exists no universal set of licensing contexts for NPIs, either. It is therefore merely a coincidence that the so-called NPIs manifest themselves as one phenomenon, as they all exhibit distributions restricted to different sets of negative contexts (cf. Van der Wouden 1997).

204 Acquiring Negative Polarity Items

Samenvatting: De verwerving van negatief-polaire uitdrukkingen

Negatief-polaire uitdrukkingen (Engels: Negative Polarity Items (NPI's)) zijn woorden of uitdrukkingen die alleen voorkomen in bepaalde negatieve contexten (Ladusaw 1979). Het modale werkwoord *hoeven* is zo'n NPI: het is wel mogelijk om te zeggen *Sam hoeft niet te eten*, maar *Sam hoeft te eten* wordt als afwijkend beschouwd. Een ander voorbeeld is de idiomatische uitdrukking *er een bal van snappen*, die ook een negatieve context vereist om grammaticaal te zijn: *Kees snapt er geen bal van* kan wel, maar *Kees snapt er een bal van* is ongrammaticaal.

Tot op heden zijn er in de literatuur diverse eigenschappen van NPI's onderzocht, zoals de variatie onder NPI's in verschillende talen (Giannakidou 2011; Haspelmath 1997), de verschillende syntactische en semantische categorieën waartoe NPI's kunnen behoren (Hoeksema 1994; Israel 1996; Van der Wouden 1994), de elementen die een NPI kunnen licenseren (Fauconnier 1975, 1978; Ladusaw 1979), en de taxonomie van NPI's op basis van hun sterktes, afhankelijk van de soorten negatieve contexten waarin ze wel of niet kunnen voorkomen (Van der Wouden 1994; Zwarts 1986, 1998).

In tegenstelling tot de bovengenoemde onderwerpen verkent dit proefschrift de verwerving van NPI's. Sinds het begin van het onderzoek naar NPI's heeft de verwerving van NPI's weinig aandacht gekregen. Het onderzoek naar dit onderwerp is tot op heden beperkt tot het Engelse *any* 'enig(e)' (Tieu 2010, 2013), *hoeven* en *meer* in het Nederlands (Koster en Van der Wal 1996; Van der Wal 1996), en het Mandarijnse *renhe* 'enig(e)' (Huang en Crain 2014b). Het geringe aantal aan dit soort studies naar de verwerving van NPI's vormt een aanleiding voor het huidige onderzoek.

Een andere reden om NPI's te onderzoeken vanuit het perspectief van taalverwerving ligt in het leerbaarheidsprobleem dat besloten ligt in het bestaan van NPI's in natuurlijke talen. Taalverwerving vindt plaats op basis van positieve evidentie, oftewel taalinput die bestaat uit grammaticale taaluitingen in de doeltaal (cf. Marcus 1993; Pinker 1984, 1995). Dat wil zeggen dat kinderen tijdens de verwerving van NPI's alleen 'goede' zinnen horen, zoals *Sam hoeft niet te eten* of *Kees snapt er geen bal van*, maar nooit geconfronteerd worden met 'slechte' zinnen, zoals *Sam hoeft te eten* of *Kees snapt er een bal van*. De 'slechte' zinnen, die ongelicenseerde NPI's bevatten, zijn ongrammaticaal, en komen dus niet voor in de taalinput. Daar staat tegenover dat deze redenering niet de andere kant op werkt: de afwezigheid van bepaalde constructies in de input betekent niet noodzakelijkerwijs dat ze ongrammaticaal zijn. Maar hoe kunnen kinderen dan de beperkte distributie van NPI's verwerven louter op basis van positieve evidentie?

206 Acquiring Negative Polarity Items

Bovendien kan onderzoek naar de verwerving van NPI's ons helpen begrijpen waarom NPI's uiteindelijk NPI's zijn geworden. De redenering hiervoor is eenvoudig: hoe we de taal die we spreken uiteindelijk analyseren is een gevolg van hoe we deze hebben verworven. Onderzoek naar het leerproces achter de taalontwikkeling kan ons dus inzicht bieden in hoe de grammatica in elkaar steekt. Binnen de context van NPI's wil dit zeggen dat de verwerving van NPI's ons kan laten zien hoe NPI's worden geanalyseerd in de verschillende ontwikkelingsfasen. Dus: onderzoek naar de verwerving van NPI's kan duidelijkheid bieden over waarom NPI's nou eigenlijk NPI's zijn.

Om NPI's te onderzoeken vanuit het perspectief van taalverwerving worden in dit proefschrift drie onderzoeksvragen gesteld en beantwoord.

Vraag 1: Wat voor leerstrategie(ën) gebruiken kinderen om NPI's te verwerven?

Vraag 2: Welke verschillende leerpad(en) voor de verwerving van NPI's komen voor?

Vraag 3: Wat leert de verwerving van NPI's ons over de aard van NPI's?

Om deze vragen te beantwoorden worden drie NPI's uit verschillende talen bestudeerd. Dit zijn het Nederlandse *hoeven*, het Engelse *any* 'enig(e),' en het Mandarijnse *shenme* 'een/enkele.' Er zijn verschillende redenen waarom deze NPI's zijn gekozen voor het onderzoek in dit proefschrift. Een van deze redenen is dat deze NPI's allemaal zeer regelmatig voorkomen in kindertaal; zelfs tweejarigen kunnen deze NPI's al gebruiken. Dit zorgt er niet alleen voor dat er voldoende corpusdata beschikbaar zijn om statistische analyses uit te voeren, maar het garandeert ook dat dit proefschrift geen woorden onderzoekt die een kind niet (goed) kent.

Een andere reden om *hoeven*, *any*, en *shenme* te kiezen heeft te maken met hun verschillende polariteitsterktes. NPI's kunnen, zoals eerder al genoemd is, geclassificeerd worden op basis van hun verschillende sterktes, afhankelijk van de negatieve contexten waarin ze wel of niet kunnen voorkomen (cf. Zwarts 1986, 1998). Het Engelse *any* is een *zwak* NPI, dat voorkomt in zogenaamde *monotoon dalende* contexten (cf. Ladusaw 1979), terwijl het Nederlandse *hoeven* en het Mandarijnse *shenme* respectievelijk een sterkere en een zwakkere sterkte hebben in vergelijking met *any*. *Hoeven* wordt als een *sterk/zwak* NPI gecategoriseerd, dat beperkt is tot sommige, maar nadrukkelijk niet alle, monotoon dalende contexten (het komt voor binnen het bereik van een zinsnegatie of een negatief onbepaald voornaamwoord, maar niet in conditionele zinnen of in het eerste argument van een universele kwantor). *Shenme*, aan de andere kant, wordt geclassificeerd als een *superzwak* NPI, vanwege zijn distributie in een superset van de verzameling monotoon dalende contexten: zogenaamde *nonveridicale* contexten (cf. Giannakidou 1997; Zwarts 1995). De keuze voor

Samenvatting: De verwerving van negatief-polaire uitdrukkingen 207

NPI's van verschillende sterktes is cruciaal voor de analyse van eventuele universele leerstrategieën en/of verwervingspatronen van verschillende NPI's, vooral waar het de vraag betreft of NPI's met verschillende sterktes om dezelfde reden NPI's zijn.

De derde reden om te kiezen voor *hoeven*, *any*, en *shenme* is dat ze uit drie verschillende talen komen. Aangezien het fenomeen NPI in verschillende talen bestaat, kan een – weliswaar kleine – selectie van NPI's uit verschillende talen relatief gezien een representatief overzicht bieden van de verwerving van NPI's in het algemeen.

Om onderzoeksvragen 1 (wat zijn de mogelijke leermechanisme(s)) en 2 (wat zijn de mogelijke leerpad(en)) te beantwoorden, wordt de verwerving van de drie gekozen NPI's onderzocht door corpusonderzoek (in het geval van het Nederlandse *hoeven*, het Engelse *any*, en het Mandarijnse *shenme*) en experimenteel onderzoek (in het geval van het Nederlandse *hoeven* en het Mandarijnse *shenme*). Voor onderzoeksvraag 3, gericht op het verkennen van de onderliggende reden(en) voor NPI-vorming, worden de analyses uit het verwervingsproces van deze drie NPI's nader onderzocht. Dit wordt gedaan door een hypothese op te stellen over de onderliggende analyse, op basis van de distributiepatronen die in late kindertaal voorkomen, maar ook door te kijken hoe deze NPI's zich tot deze distributies hebben ontwikkeld, gezien de distributiepatronen die in vroege kindertaal gevonden worden.

De verwerving van het Nederlandse NPI *hoeven* wordt eerst onderzocht door middel van een corpusonderzoek, dat in Hoofdstuk II wordt gepresenteerd. Met name de distributie van dit NPI in de ontwikkeling van Nederlandse kindertaal wordt geanalyseerd aan de hand van data uit de CHILDES-database (MacWhinney 2009). De resultaten van het corpusonderzoek wijzen op twee ontwikkelingsfases in de verwerving van het Nederlandse NPI. In de eerste fase, bij kinderen onder de vier jaar, komt het NPI *hoeven* alleen voor in ontkennende zinnen die ingeleid worden door *niet*; in de daarop volgende fase, daarentegen, wordt *hoeven* ook gebruikt in ontkennende zinnen die ingeleid worden door een negatief onbepaald voornaamwoord, zoals *niks* of *geen*. Naar aanleiding van deze getrapte ontwikkeling wordt het volgende verwervingsproces voorgesteld. Omdat in de taalinput het NPI *hoeven* in meer dan 80% van de gevallen binnen het bereik van de negatie *niet* voorkomt, is het waarschijnlijk dat kinderen beginnen met de aanname dat *hoeven* lexicaal geassocieerd wordt met *niet*, wat in de kindergrammatica van de vroege ontwikkelingsfase uitgedrukt kan worden als [HOEVEN NIET]. Later, als de Nederlandse kinderen geconfronteerd worden met meer inputevidentie, of meer kunnen analyseren, passen ze hun analyse van het NPI aan, aan de hand van de nieuwe inputdata, om zo zoveel mogelijk taalinput te verklaren. Maar wat is dan de nieuwe analyse van het NPI in de grammatica van de oudere Nederlandse kinderen?

Om te verkennen hoe oudere Nederlandse kinderen het NPI *hoeven* analyseren wordt in Hoofdstuk II de decomponeerbare analyse van negatieve onbepaalde voornaamwoorden gehanteerd, zoals voorgesteld door Jacobs

208 Acquiring Negative Polarity Items

(1980). In Jacobs' benadering bevatten negatieve onbepaalde voornaamwoorden in talen als het Duits aan de ene kant een abstracte negatie, en, aan de andere kant, een existentiële kwantor. Hoofdstuk II breidt deze decompositionele analyse uit naar het Nederlands (zie ook Penka en Zeijlstra 2005), en beargumenteert dat in de nieuwe analyse van Nederlandse kinderen *hoeven* lexicaal geassocieerd wordt met een abstracte negatie, die uitgespeld kan worden als de negatieve markeerder *niet* op zinsniveau, of die geïncorporeerd kan worden in negatieve onbepaalde voornaamwoorden. Deze nieuwe analyse, die in de kindergrammatica van de latere ontwikkelingsfase weergegeven kan worden als [HOEVEN NEG], verklaart niet alleen dat *hoeven* voorkomt binnen het bereik van de zinsnegatie *niet*, maar ook dat het voorkomt in combinatie met negatieve onbepaalde voornaamwoorden.

De abstracte negatie NEG kan ook worden geanalyseerd als geïncorporeerd onderdeel van sommige monotoon dalende contexten, die bijvoorbeeld geïntroduceerd worden door *weinig* of *alleen* (cf. Iatridou en Zeijlstra 2013; Penka en Zeijlstra 2005), maar nadrukkelijk niet door conditionele zinnen of het eerste argument van een universele kwantor. Daarom leidt deze nieuwe analyse bovendien tot een distributiepatroon van het Nederlandse *hoeven* als een sterk/zwak NPI, dat beperkt wordt tot sommige, maar nadrukkelijk niet alle, monotoon dalende contexten – precies zoals dit in het volwassen taalgebruik wordt waargenomen.

Het leerproces waarbij Nederlandse kinderen beginnen met [HOEVEN NIET] en later hun analyse wijzigen naar [HOEVEN NEG] wordt verder onderzocht vanuit een experimenteel perspectief. Hoofdstuk III beschrijft een zinsrepetitietaak, waarin bij Nederlandse kinderen de kennis van het NPI wordt getoetst in verschillende testcondities. In het experiment wordt *hoeven* in zes verschillende contexten gemanipuleerd, waarvan vijf de grammaticale licenseringscondities betreffen (gelicenseerd door *niet*, *geen*, *niemand*, *weinig*, en *alleen*) en één ongrammaticaal gebruik van het NPI (in een bevestigende context). De data die verzameld zijn bij 132 eentalige Nederlands sprekende kinderen (leeftijd: 2;09–5;10; gemiddeld=4;04; SD=9.3 maanden) ondersteunen het verwervingspad dat ook in het corpusonderzoek is gevonden. De analyse van het leerpad van [HOEVEN NIET] naar [HOEVEN NEG] wordt zelfs verder genuanceerd door de experimentele resultaten. Driejarigen lijken een tweede lexicaal frame [HOEVEN GEEN] te hebben geconstrueerd, naast [HOEVEN NIET], aangezien hun resultaten in het experiment voor de testconditie met *niet* net zo goed zijn als voor de testconditie met *geen*. Op basis van de resultaten van het corpusonderzoek en het experiment wordt geconcludeerd dat de verwerving van het Nederlandse NPI *hoeven* twee fases kent: een lexicale fase, vóór de leeftijd van vier jaar oud, waarin de kindergrammatica bestaat uit de twee lexicale frames [HOEVEN NIET] en [HOEVEN GEEN], en een abstracte fase, vanaf vlak na het vierde jaar, waarin de kindergrammatica enkel de abstracte analyse [HOEVEN NEG] bevat.

De verwerving van het Mandarijnse NPI *shenme* 'een/enkele' wordt onderzocht aan de hand van een corpusonderzoek, dat in Hoofdstuk IV

Samenvatting: De verwerving van negatief-polaire uitdrukkingen 209

wordt beschreven, en een experiment met een zinsrepetitietoets, dat in Hoofdstuk V wordt gepresenteerd. Aangezien de literatuur tot nu toe geen systematisch en kwantitatief overzicht biedt van de distributie van dit Mandarijnse NPI, biedt Hoofdstuk IV eerst een analyse van de distributie van *shenme* in volwassen spreektaal, om daarna de distributie van dit NPI in CHILDES te onderzoeken. De verzamelde data over het volwassen Mandarijn laten zien dat *shenme*, hoewel het voornamelijk voorkomt in vraagwoordvragen, ook voorkomt in andere nonveridicale contexten, zoals het bereik van een zinsnegatie, conditionele zinnen, *ja/nee*-vragen en epistemische contexten met sprekersonzekerheid. Daarentegen komt *shenme* juist niet voor in veridicale contexten. Omdat de distributie beperkt is, op de hierboven beschreven wijze, wordt in dit hoofdstuk een uniforme benadering voorgesteld waarin *shenme* een superzwak NPI is, dat uitsluitend in alle nonveridicale contexten voorkomt. Hoofdstuk IV volgt Giannakidou's benadering van enkele Griekse NPI's (2002, 2011), en verklaart de status van *shenme* als NPI als een gevolg van zijn non-referentialiteit. Vanwege zijn gebrek aan referentialiteit kan *shenme* alleen voorkomen in een nonveridicale omgeving, omdat het in zo'n context niet gedwongen wordt ergens naar te verwijzen (Giannakidou 2010, 2011).

Met betrekking tot de verwerving van dit Mandarijnse NPI blijken de verzamelde data uit CHILDES te duiden op twee ontwikkelingsfasen. In de eerste fase analyseren kinderen *shenme* louter als vraagwoord, wat verklaart waarom jongere kinderen *shenme* alleen gebruiken in vraagwoordvragen, maar niet in andere nonveridicale omgevingen. Dit valt te verklaren omdat *shenme* in de taalinput in 97% van de gevallen als vraagwoord wordt gebruikt. In de daarop volgende fase, kort na vierjarige leeftijd, wordt het NPI daarentegen heranalyseerd. Kinderen zien *shenme* dan niet meer alleen als vraagwoord, maar als superzwak NPI, dat in het hele scala aan nonveridicale contexten voor kan komen, waaronder in vraagwoordvragen. De nieuwe analyse wordt ook verklaard aan de hand van inputevidentie – ervan uitgaande dat kinderen de kennis van *nonveridicaliteit* al verworven hebben.

De bovengenoemde resultaten van het corpusonderzoek wat betreft de verwerving van het Mandarijnse NPI worden verder onderzocht in een experiment met een zinsrepetitietoets, zoals beschreven in Hoofdstuk V. Om exact te kunnen bepalen wat kinderen weten over het licensen van het NPI, bevat het experiment zes verschillende testcondities. Deze condities zijn (i) negatieve zinnen die ingeleid worden door een zinsnegatie, (ii) conditionele zinnen, (iii) epistemische contexten die ingeleid worden door een modaal bijwoord zoals *keneng* 'waarschijnlijk', (iv) *ja/nee*-vragen, (v) vraagwoordvragen, en (vi) een ongelicenseerde conditie waarbij *shenme* in de voltooide tijd geplaatst wordt.

De data, verkregen van 88 eentalige Mandarijn sprekende kinderen (leeftijden: 2;11–4;09; gemiddelde=3;11; SD=6 maanden), laten zien dat deze kinderen vanaf twee jaar op dezelfde manier met vraagwoordvragen omgaan als volwassenen, terwijl dit voor de andere vier grammaticale condities pas geldt bij kinderen van bijna vier. Deze resultaten wekken sterk

210 Acquiring Negative Polarity Items

de indruk dat de verwerving van dit NPI in twee fases verloopt, overeenkomend met, respectievelijk, een vroege en een late kindergrammatica.

Waar de vroege grammatica bestaat uit een analyse van *shenme* als vraagwoord, bevat de late grammatica daarentegen een abstracte NPI-analyse. Dit biedt ondersteuning voor de resultaten van het corpusonderzoek uit Hoofdstuk IV. Daarom wordt de conclusie getrokken dat Mandarijn sprekende kinderen de distributionele beperkingen van het NPI kunnen afleiden zonder negatieve evidentie: ze beginnen met de zeer beperkte aanname dat *shenme* slechts een vraagwoord is, en stappen daarna over op de minder beperkte analyse dat *shenme* een superzwak NPI is.

De verwerving van het Engelse NPI *any* 'enig(e)' wordt onderzocht door middel van een corpusonderzoek in de CHILDES-database, zoals beschreven in Hoofdstuk VI. Vergelijkbaar met wat in Hoofdstuk II tot en met V is beschreven over de verwerving van de Nederlandse en Mandarijnse NPI's, blijkt de verwerving van het Engelse NPI *any* ook twee ontwikkelingsfases door te maken. Kinderen die het Engels verwerven lijken voor hun vierde dit NPI altijd te gebruiken in zinnen die ingeleid worden door de zinsnegatie *not* 'niet', of in *ja/nee*-vragen met een negatieve verwachting. In de late fase, daarentegen, is de distributie van het Engelse NPI uitgebreider. In plaats van alleen binnen het bereik van *not* of in *ja/nee*-vragen met een negatieve verwachting, gebruiken kinderen ouder dan vier jaar *any* ook in andere monotoon dalende omgevingen, zoals in ontkennende zinnen die geïntroduceerd worden door een negatief onbepaald voornaamwoord, of in conditionele zinnen.

Om de aangetoonde distributies in vroeg en laat kinder-Engels te verklaren wordt in Hoofdstuk VI een leerproces voorgesteld dat als volgt beschreven kan worden. In de eerste fase hanteren Engelse kinderen een analyse van het NPI *any* waarin het zich binnen het directe bereik van een zinsnegatie bevindt, of als een logische negatie in een *ja/nee*-vraag met een negatieve verwachting. Deze eerste poging om het Engelse NPI te analyseren is gebaseerd op inputevidentie, aangezien in de input *any* in ongeveer 58% van de gevallen door de zinsnegatie *not* wordt gelicenseerd, en in ongeveer 33% van de gevallen voorkomt in *ja/nee*-vragen. De *ja/nee*-vragen waarin *any* voorkomt in de taalinput hebben niet altijd een negatieve verwachting. Dat minstens 80% van de *ja/nee*-vragen met dit NPI die Engelse twee- en driejarigen stellen wel een negatieve verwachting hebben, zou kunnen betekenen dat jongere kinderen de *ja/nee*-vragen met *any* in de taalinput interpreteren als vragen met een negatieve verwachting.

De oorspronkelijke analyse dat *any* binnen het directe bereik van een zinsnegatie moet voorkomen kan niet verklaren dat *any* gevonden wordt in verschillende monotoon dalende contexten in de input, zoals binnen het bereik van een negatief onbepaald voornaamwoord, of in conditionele zinnen. Wanneer Engels verwervende kinderen geconfronteerd worden met inputevidentie die niet verklaard kan worden door hun oorspronkelijke beperkte analyse moeten ze dus het NPI opnieuw analyseren. Doordat de

Samenvatting: De verwerving van negatief-polaire uitdrukkingen 211

distributie van *any* in de input beperkt is tot diverse monotoon dalende contexten, komen kinderen tot de hypothese dat het NPI exhaustief moet zijn. Hieruit leiden ze af dat er een abstracte exhaustificatie-operator moet zijn, die van toepassing is op elke monotoon dalende taaluiting met *any* in de input. Dat de exhaustificatie-operator verplicht aanwezig is in de latere fase volgt uit de theorie van Chierchia (2004, 2006, 2013). Volgens deze theorie draagt *any* een σ -kenmerk dat verplichte domeinalternatieven introduceert, en dat het nodig maakt dat er feature checking plaatsvindt door een abstracte exhaustificatie-operator. Kortom, Engelse kinderen beginnen met de analyse dat *any* een direct bereiksrelatie heeft met een zinsnegatie, en komen vervolgens tot de heranalyse dat dit NPI zelf een σ -kenmerk kent, die leidt tot de aanwezigheid van een covert exhaustificeerder.

Op grond van de bevindingen over de verwerving van de drie NPI's uit het corpusonderzoek en de experimenten worden de drie onderzoeksvragen als volgt beantwoord. Wat betreft onderzoeksvraag 1, over de mogelijke leermechanisme(s) die kinderen bij gebrek aan negatieve evidentie zouden kunnen gebruiken in de verwerving van NPI's, geldt dat het cross-linguïstische onderzoek in dit proefschrift aantoont dat kinderen een leerstrategie volgen waarbij ze op een conservatieve manier hun hypothesen uitbreiden (Engels: *conservative widening learning hypothesis*; cf. Manzini en Wexler 1987; Snyder 2008; Van der Wal 1996). Zo kan het leerbaarheidsprobleem worden opgelost. De verwerving van de drie onderzochte NPI's – die verschillende syntactische categorieën en polariteitsterktes kennen – vertoont bij alle drie een ontwikkeling in twee fases. Kinderen vanuit verschillende taalachtergronden (d.w.z. Nederlands, Engels, en Mandarijn) beginnen allemaal met een (zeer) beperkte aanname over de onderzochte NPI's. Deze eerste stap wordt uitsluitend gestuurd door inputevidentie. In de daarop volgende fase vormen ze een minder beperkte analyse van de NPI's. Dat gebeurt wanneer de kinderen geconfronteerd worden met meer inputdata die niet overeenkomen met hun eerste beperkte aanname, of wanneer ze meer van de data kunnen verwerken en analyseren.

Voor de onderzoeksvraag 2, die gericht is op het vinden van mogelijke leerpad(en) in de verwerving van NPI's, leiden de resultaten uit zowel het corpusonderzoek als de experimenten tot de volgende conclusies. Ten eerste bestaat er geen universeel leerpatroon voor NPI's (anders dan wat door Van der Wal 1996 werd aangenomen). Ten tweede blijkt de verwerving van verschillende NPI's aparte patronen te volgen, afhankelijk van de distributionele eigenschappen van de diverse NPI's in de input en de onderliggende semantische eigenschappen voor de mogelijke licenserende contexten voor die NPI's.

Het feit dat verschillende NPI's diverse verwervingspatronen vertonen leidt verder tot de conclusie dat verschillende NPI's vanwege zeer uiteenlopende redenen NPI's zijn – wat een antwoord is op onderzoeksvraag 3: wat de verwerving ons kan vertellen over de aard van NPI's. De verschillende leerpaden vragen om aparte verklaringen voor de

212 Acquiring Negative Polarity Items

mogelijke leerprocessen. In het geval van het Nederlandse *hoeven* suggereren de resultaten van zowel het corpusonderzoek als het experiment dat Nederlandse kinderen uiteindelijk een lexicale associatie maken tussen het NPI aan de ene kant en een abstracte negatie NEG aan de andere kant. Verder wordt, aan de hand van Postal's benadering van NPI-vorming (Postal 2000; zie ook Collins en Postal 2014), de hypothese geformuleerd dat *hoeven* in het mentale lexicon van de taalverwerver in de latere ontwikkelingsfase wordt weergegeven als [HOEVEN NEG]. Dit wil zeggen dat het Nederlandse *hoeven* een NPI is vanwege de lexicale band met de abstracte negatieve vorm NEG. Het Engelse NPI *any*, daarentegen, lijkt niet dezelfde onderliggende analyse te delen. De resultaten van het onderzoek naar spontane kindertaal ondersteunen de hypothese dat Engelse vierjarigen een σ -kenmerk aan het NPI toekennen, waardoor het alleen voorkomt in die contexten waar exhaustificatie niet leidt tot een logische tegenspraak (cf. Chierchia 2004, 2006, 2013). Dit betekent dat *any* zijn gevoeligheid voor negatieve polariteit verkrijgt omdat het een σ -kenmerk heeft, en dus verplicht exhaustief moet zijn. In het geval van het Mandarijnse NPI, ten slotte, laten het corpusonderzoek en het experiment zien dat in ieder geval de vierjarigen dit NPI al kunnen licenseren in het hele scala aan nonveridicale contexten, oftewel condities waarin de aanwezigheid van een referent niet vereist is. De analyse waarvan aangenomen wordt dat deze een dergelijk breed distributiepatroon van *shenme* in laat kinder-Mandarijn verklaart, is dat *shenme* een afhankelijke variabele bevat, wat het NPI referentieel deficiënt maakt en, dus de distributie beperkt tot nonveridicale contexten (cf. Giannakidou 2002, 2010, 2011).

Het onderzoek naar de verwerving laat zien dat NPI's van verschillende syntactische categorieën, polariteitsterktes en talen NPI's zijn om verschillende redenen. Er bestaat ook geen universele verzameling van licenserende condities voor NPI's. Het is dan ook louter toeval dat de zogenaamde NPI's zich manifesteren als één fenomeen, aangezien ze allemaal distributies vertonen die beperkt zijn tot verschillende soorten negatieve contexten (cf. Van der Wouden 1997).

Curriculum Vitae

Jing Lin was born on April 1, 1983 in Liaoning Province (P.R. China). In 2002 she enrolled in the BA programme *Dutch Language and Culture* at the Communication University of China (CUC, Beijing), which she successfully completed in June 2006. In 2008 she came to the Netherlands for further studies in Dutch linguistics at the University of Amsterdam (UvA, Amsterdam). In 2009 and 2011 she enrolled in the MA programme *Dutch Language and Culture* and the rMA programme *Linguistics* at the UvA. She graduated from these programmes in 2010 and 2011, respectively, both *cum laude*. During her studies in the Netherlands, she obtained a Huygens Scholarship awarded by Nuffic. In September 2011 she started her PhD research at the UvA on the acquisition of Negative Polarity Items under supervision of prof. dr. Fred Weerman and prof. dr. Hedde Zeijlstra. She visited Harvard University and the University of Chicago in the spring of 2014. She also taught BA courses at the UvA in the second, third, and fourth years of her PhD project.

214 Acquiring Negative Polarity Items

简历

林婧于一九八三年四月一日出生于中国辽宁。她于二零零二年在
中国传媒大学（北京）修读本科专业“荷兰语语言与文化”，并于二零
零六年本科毕业，顺利获得学士学位。二零零八年，她来到荷兰阿
姆斯特丹大学（阿姆斯特丹）继续学习荷兰语语言学。二零零九年
和二零一一年，她开始在阿姆斯特丹大学攻读硕士项目“荷兰语语言
与文化”和研究类硕士项目“语言学”，并于二零一零年和二零一一年
分别以优异成绩毕业并获得两项硕士学位。在荷兰留学期间，她曾
获得 Nuffic 颁发的 Huygens 奖学金。二零一一年九月，她在阿姆斯
特丹大学开始了博士项目的研究，项目课题是负极词习得，项目导
师是 Fred Weerman 教授和 Hedde Zeijlstra 教授。在二零一四年春天，
她先后到哈佛大学和芝加哥大学进行学术交流。在博士项目的第二，
第三和第四年，她也在阿姆斯特丹大学教授过本科课程。