EBERHARD KARLS
UNIVERSITÄT
TÜBINGEN

COMPARING COMPARATIVES

New Perspectives from Fieldwork and Processing

Polina Berezovskaya

Dissertation
zur Erlangung des akademischen Grades
Doktor der Philosophie

2020

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Für Mascha und Fabian

*I will not reason and **compare**:*
my business is to create.
∼William Blake

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Abstract

This dissertation investigates comparative constructions in Russian, Tundra Nenets and German. The focus lies on cross-linguistic variation in the standard and differential argument of comparatives.

Concerning variation in the standard argument, an analysis is suggested for Russian genitive-marked comparatives. It involves a phrasal semantic comparative operator by Kennedy (1997) for which evidence is provided. Crucial to the analysis is the diagnostics that helps to distinguish between Kennedy's and Heim's operator (Heim 1985), namely DP-internal vs. DP-external readings of attributive comparatives. For Nenets this proposed diagnostics helps to determine that Heim's operator is the correct one. For German, these constructions are tested with the help of reading-time and eye-tracking experiments. The data obtained from the experiments support the predictions that arise from the standard degree analysis in tandem with insights from Hackl et al. (2012).

Concerning variation in the the differential argument, the Nenets suffix *-rka* that appears in comparison constructions is analyzed as a degree modifier. It modifies the differential degree in comparatives and states that the difference is small. A new composition rule called Degree Restrict enables the suffix to combine with the differential argument. With the help of this rule, elements of different semantic types can be conjoined. This type of extended predicate modification is familiar from other domains in the grammar, the domain of individuals (Restrict by Chung & Ladusaw 2004) and the domain of events (Event Identification by Kratzer 1994,1996). The need for Degree Restrict in the composition of Nenets comparatives provides evidence for this type of extended predicate modification in the domain of degrees, something that has not been proposed anywhere before. This raises general questions about the inventory of semantic composition rules and opens up new paths for a global grammatical generalization that motivates it.

comparatives, degree semantics, quantification, modification, restriction, scalarity, fieldwork, processing, Russian, Tundra Nenets, German

Abstract (German)

Die vorliegende Dissertation untersucht Komparativkonstruktionen im Russischen, Tundra Nenzischen und Deutschen. Der thematische Schwerpunkt liegt auf sprachübergreifender Variation im Standard- und Differentialargument des Komparativs.
Betreffend der Variation im Standardargument wird eine Analyse für Genitiv markierte Komparative im Russischen vorgeschlagen. Diese beinhaltet einen phrasalen semantischen Komparativoperator von Kennedy (1997), für welchen im Russischen Evidenz erbracht wird. Ausschlaggebend für die Analyse ist eine Diagnostik, die es ermöglicht, zwischen Kennedy's und Heim's (1985) Operator zu unterscheiden. Bei der Diagnostik handelt es sich um DP-interne vs. DP-externe Lesarten von attributiven Komparativen. Fürs Nenzische ist diese Diagnostik zentral, denn sie hilft zu bestimmen, dass der Heimsche Komparativoperator hier der richtige ist. Diese Konstruktionen werden fürs Deutsche mit Hilfe von Lesezeit- und Blickbewegungsexperimenten getestet. Die aus den Experimenten erhaltenen Daten unterstützen die Vorhersagen, die aufgrund der Standard-Gradanalyse zusammen mit Resultaten aus Hackl et al. (2012) gemacht werden.
Betreffend der Variation im Differentialargument wird das Suffix *-rka*, das im Nenzischen in Komparativen vorkommt, als ein Gradmodifikator analysiert. Es modifiziert das Differentialargument in Komparativen und besagt, dass die Differenz klein ist. Eine neue Kompositionsregel, genannt Degree Restrict, ermöglicht, dass das Suffix mit dem Differentialargument komponiert werden kann. Mit Hilfe dieser Regel können Elemente unterschiedlichen semantischen Typs miteinander durch Konjunktion verknüpft werden. Diese Art von erweiterter Prädikatenmodifikation ist auch aus anderen Bereichen der Grammatik bekannt, dem Bereich der Individuen (Restrict von Chung & Ladusaw 2004) und dem Bereich der Ereignisse (Event Identification von Kratzer 1994,1996). Die Notwendigkeit von Degree Restrict in der Komposition nenzischer Komparative liefert Evidenz für diese Art von erweiterter Prädikatenmodifikation in der Domäne der Grade. Es ist das erste Mal, dass eine solche Operation im Bereich der Grade vorgeschlagen wird. Diese wirft grundsätzliche Fragen nach dem Inventar an semantischen Kompositionsregeln auf und eröffnet neue Wege für eine globale grammatische Generalisierung die diese motiviert.

Komparative, Gradsemantik, Quantifikation, Modifikation, Restriktion, Skalarität, Feldforschung, Verarbeitung, Russisch, Tundra Nenzisch, Deutsch

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Abbreviations Used in Glosses

abbreviation	explanation
1.	first person
2.	second person
3.	third person
ABL.	ablative
ACC.	accusative
ADD.	additive particle
ADJ.	adjective
ADV.	adverb(ial)
AGR.	subject-verb agreement
AN.	action nominal
COMP.	comparative
CONNEG.	connegative
CONT.	continuative
DALAT.	dalative
DAT.	dative
DIM.	diminutive
DISC.	discourse particle
DUR.	durative
ESS.	essive
EXCL.	exclusive particle
F.	feminine
FOC.	focus
FUT.	future
GEN.	genitive
HAB.	habitual
IMP.	imperative
IMPF.	imperfective
INCH.	inchoative
INF.	infinitival form
INSTR.	instrumental
LIM.	limitative
LOC.	locative
NEG.	negation
NOM.	nominative
OBJ.	object agreement
PL.	plural
POSS.	possessive
PFV.	perfective
PREP.	prepositional case
PROB.	probabilitative
PROL.	prolative
PST.	past
PTCP.	participle
SG.	singular
TOP.	topic marker

Other Abbreviations

abbreviation	explanation
B17	Beck et al. (2009)
CompDeg	Comparison with a Degree
ConC	Contextual Comparative
DAP	Degree Abstraction Parameter
DegPP	Degree Phrase Parameter
DegQ	Degree Question
DiffC	Differential Comparative
DiffMod	Differential Modifier
DR	Degree Restrict
DSP	Degree Semantics Parameter
EI	Event Identification
Ext	DP-external reading in attributive comparatives
Int	DP-internal reading in attributive comparatives
FA	Function Application
LF	Logical Form
MP	Measure Phrase
NegIs	Negative Island Effect
PDN	Present Day Nenets
PSP	Presupposition
RelCl	relative clause
ROI	region of interest
RT experiment	reading times experiment
SubC	subcomparative
QR	Quantifier Raising

Sign Key for Nenets

-	Russian	Nenets	Latin	IPA
1	А / а	А / а	a	/a/
2	Б / б	Б / б	b	/b/
3	В / в	В / в	v	/v/
4	Г / г	Г / г	g	/g/
5	Д / д	Д / д	d	/d/
6	Е / е	Е / е	je (initial)/ ˈe (medial)	/je/
7	Ё / ё	Ё / ё	jo (initial)/ ˈo (medial)	/jo/
7	Ж / ж	Ж / ж	zh	/ʐ/
8	З / з	З / з	z	/z/
9	И / и	И / и	i	/i/
10	Й / й	Й / й	j	/j/
11	К / к	К / к	k	/k/
12	Л / л	Л / л	l	/l/
13	М / м	М / м	m	/m/
14	Н / н	Н / н	n	/n/
15	-	Ӈ / ӈ	ŋ	/ŋ/
16	О / о	О / о	o	/o/
17	П / п	П / п	p	/p/
18	Р / р	Р / р	r	/r/
19	С / с	С / с	s	/s/
20	Т / т	Т / т	t	/t/
21	У/ у	У/ у	u	/u/
22	Ф / ф	Ф / ф	f	/f/
23	Х / х	Х / х	x	/x/
24	Ц / ц	Ц / ц	c	/t͡s/
25	Ч / ч	Ч / ч	ch	/t͡ɕ/
26	Ш / ш	Ш / ш	sh	/ʂ/
27	Щ / щ	Щ / щ	shh	/ɕɕ/
28	Ъ / ъ	Ъ / ъ	*hard sign*	*silent*
29	Ы / ы	Ы / ы	y	[ɨ]
30	Ь / ь	Ь / ь	ˈ	/ ˈ/
31	Э / э	Э / э	e	/e/
32	Ю / ю	Ю / ю	ju (initial)/ ˈu (medial)	/ju/
33	Я / я	Я / я	ja (initial)/ ˈa (medial)	/ja/
34	-	ˈˈ	ˈˈ (unvoiced)	ʔ
35	-	ˈ	h (voiced)	ʔ̬

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Chapter 1

Introduction

This dissertation investigates a prominent phenomenon of the human language ability, namely the expression of comparison. This phenomenon is of high interest both from a linguistic, but also from a cognitive perspective: Comparing entities along certain relevant dimensions, as, for instance, along the dimension of height, is an elementary cognitive ability that can be found in vertebrates and beyond (cf. Feigenson, Dehaene & Spelke 2004 for the specific case of numerical dimensions). Natural languages differ greatly in how they express comparison. For instance, the way European languages use comparative morphology is easily not the most common when we look at the cross-linguistic pircture (cf. Stassen 1985). This thesis sets out to uncover cross-linguistic variation in comparatives in a systematic fashion by looking primarily at Tundra Nenets, Russian and German.

As of today, there exists a respectable body of work dedicated to the topic of comparatives. Early works that developed a semantic theory which treated certain aspects of the topic, that for example explained certain ambiguities in comparatives, include Russell's work (Russel 1905). Cresswell (1976) is crucial to the understanding of degrees as stemming from equivalence classes. Formal semantics has started making huge progress on this topic with the seminal work of von Stechow (1984) who compares different semantic theories of comparatives. The focus of this thesis, however, is not to compare degree-based approaches against ones that do not use degrees.

The present dissertation rather sets out to use the standard analysis (cf. von Stechow 1984, Heim 1985, Heim 2001, Beck 2011) as the working framework and test how far it gets us. We want to advance on the topic of variation in the standard and the differential argument of comparatives by contributing new cross-linguistic data and new

analyses. Concerning the standard argument, I will, for instance, provide novel data of and analyses for phenomena such as genitive-marked comparatives in Russian that contributes to the question of the exact inventory of degree operators cross-linguistically. I will also experimentally test predictions that the standard approach makes by investigating the processing of attributive comparatives in German. Concerning variation in the differential argument of comparatives, the phenomenon of degree predicate modification in Tundra Nenets will be at the center of attention in Chapter 4.

By investigating variation in the standard and the differential argument of comparatives from the perspective of fieldwork and processing, we gain insights into quantification and modification in grammar. We gain insights into quantification because depending on whether the standard of comparison is genuinely clausal or genuinely phrasal, a different comparative quantifier needs to be applied. And we gain new insights into modification, because the analysis of Nenets comparatives requires modification of the differential argument. The broader topics that are thus addressed in this thesis are quantification, modification and scalarity in grammar. While quantifiers over individual types are a well-established in formal semantics (as developed by Lewis 1970, Montague 1975 and further taken up by Cresswell 1973, Barwise & Cooper 1981), degree quantifiers have not been subject to as much scrutiny. Degree modification will bring up general questions of the division of labor between composition, syntax and the lexicon. It will also lead us to the question of scalarity in grammar in general, more specifically to questions like: Are degrees confined to the domain of degree constructions? Can scalarity be exported to domains of grammar which at first glance do not seem to be scalable?

The strong fieldwork and processing perspective of this thesis allows us to refine the degree analysis of comparison constructions.

1.1 Goals of the Dissertation

I am covering the following three thematic packages:
(i) variation in the standard argument: phrasal and clausal comparative operators cross-linguistically (Ch.2)
(ii) variation in the standard argument: testing predictions of the standard analysis in combination with Hackl, Koster-Hale & Varvoutis (2012) for processing (Ch.3)
(iii) variation in the differential argument: modification of degree predicates (Ch.4)
Concerning (i), I will be looking at Russian, Nenets and German. I will provide evidence for Russian using a Kennedy-style phrasal operator in genitive-marked comparatives like

the example in (1):

(1) *Maša sil'n-ee An-i.*
Masha strong-COMP. Anya-GEN.
'Masha is stronger than Anya.'

For Nenets, there are good reasons to assume a Heim-style phrasal operator and for German, only a clausal operator is feasible according to previous research.

Not a lot is known so far about the processing of comparative constructions. By taking the standard approach that involves degree quantifiers, the thematic block (ii) will contribute to our understanding of the processing of comparatives and thus of degree quantifiers in general. Specifically, I will look at attributive comparative constructions such as (2), which are ambiguous between the DP-internal and the DP-external reading (cf. Lerner & Pinkal 1995).

(2) *Peter hired an older person than John.*

a. **DP-internal reading**: Peter hired an older person than John is.
b. **DP-external reading**: Peter hired an older person than John hired.

I will provide analyses for the ambiguous readings and deduce predictions for processing that I will subsequently test in several experiments.

Block (iii) will be approached by analyzing comparative constructions in Tundra Nenets. A peculiar case of degree modification, as I will claim, are comparatives that use the suffix *-rka* in Nenets. An example is provided in (3):

(3) *Tanya Vanya-xad pirc'a-rka.*
Tanya Vanya-ABL. tall-RKA
'Tanya is a little bit taller than Vanya.'

The composition of these constructions turns out to be non-trivial. An analysis of these constructions will be provided that uses a restriction operation in the style of Chung and Ladusaw's RESTRICT.

In the chapters to come I will answer the following research questions:

- **Q1**: What is the range of available degree operators cross-linguistically? In particular:
  a. Do we see evidence for both phrasal operators described in the literature ($\text{COMP}_{Heim1985}$ and $\text{COMP}_{Kennedy1997}$)?
  b. Or do we only need the stronger one ($\text{COMP}_{Heim1985}$) that covers a wider range of constructions?
  Specifically in:
  - Russian (Ch. 2)
  - German (Ch. 2 & Ch. 3)
  - Nenets (Ch. 2 & Ch. 4)
- **Q2**: Do we see complexity differences derived from the standard degree theory in processing? (Ch. 3)
- **Q3**: What is the semantics of comparison constructions in Nenets (Ch. 4)? In particular:
  a. How are comparative constructions best analyzed in Nenets?
  b. What is the role of the differential argument?
  c. How can degree (predicate) modification be integrated into the analysis?

I put forward the following hypotheses regarding Q1-Q3:

- **H1**:
  - $\textbf{H1}_{\textbf{R}}$: I propose that genitive-marked synthetic comparatives in Russian provide evidence for the existence of the phrasal comparative operator proposed in Kennedy (1997), although this operator is weaker than the phrasal operator proposed in Heim (1985) in the sense that a smaller range of constructions can be analyzed by it.
  - $\textbf{H1}_{\textbf{N}}$: Nenets uses COMP_{Heim}.
  - $\textbf{H1}_{\textbf{G}}$: German only has $\text{COMP}_{\text{clausal}}$ following evidence from L1-acquisition by Hohaus, Tiemann & Beck (2014).
- **H2**: According to the standard degree analysis and assumptions in Hackl, Koster-Hale & Varvoutis (2012) on individual quantifiers, attributive DP-external readings of degree constructions in German are more complex than DP-internal readings,

i.e. DP-external readings are harder to process than DP-internal readings[1].

- **H3**: Degree predicate modification in Nenets comparatives provides evidence for Degree Restriction in natural language (similar to Event Identification by Kratzer 1996 and Restrict by Chung & Ladusaw 2004).

1.2 Structure of the Dissertation

In this chapter, I will cover the preliminaries, i.e. the theoretical background that is crucial for the understanding of this thesis; namely the compositional framework in 1.3.1, basics of degree constructions in the 'standard' framework in 1.3.2 plus previous cross-linguistic research. In 1.3.3, I will briefly lay out the empirical methods that I use in this thesis. The following figure visualizes the overall structure of the dissertation.

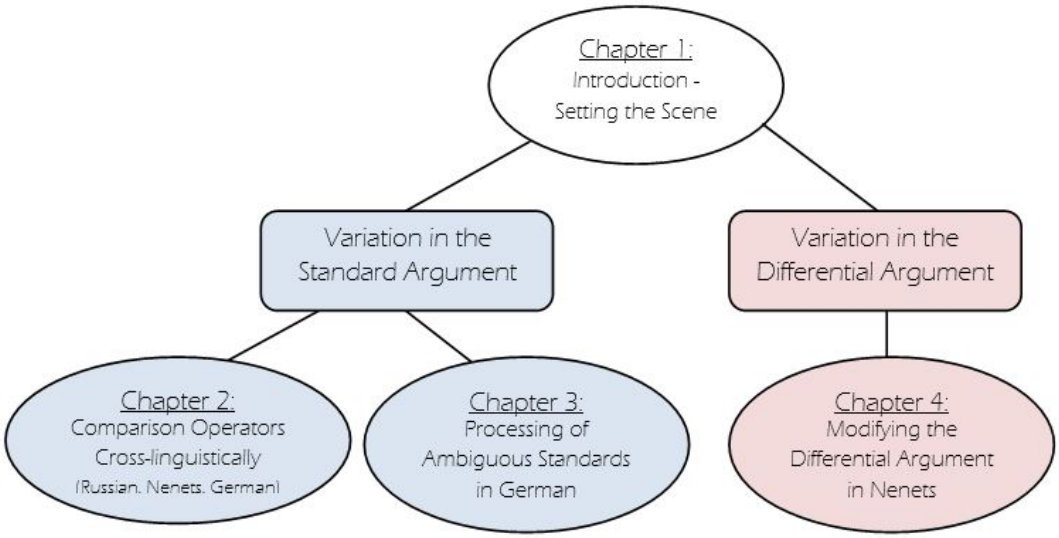


Figure 1.1: Structure of the Dissertation

In Chapter 2, which is about variation in the standard of comparatives, I provide

[1]Note that I am only testing the predictions of the degree approach, i.e. I use the very specific theoretical assumption that comparatives can be analyzed by using degree quantifiers. The predictions and the outcome are of theoretical interest, especially if we keep in mind that a Kleinian analysis (cf. e.g. Klein 1980) works without degrees and it is not clear whether or how all it would make the same testable predictions that the degree approach makes.

novel analyses of comparison constructions in **Russian**, mainly focusing on examples like (1). **Tundra Nenets**, an underrepresented Samoyedic language from the Uralic language family will also be analyzed with respect to how the standard is marked and which operator is plausible for it. Crucially, the comparative operator used is dependent on how we analyze the standard of the comparative, i.e. as a clause or as a phrase. After having established this for every language under investigation, I will provide analyses. For **Russian**, I will discuss a case of variation in the lexical inventory of comparative operators (cf. Berezovskaya & Hohaus 2015). More specifically, genitive-marked synthetic comparatives in Russian provide evidence for the phrasal comparative operator proposed in Kennedy (1997). For **Nenets**, I outline a possible Phrasal Analysis of comparison constructions that uses the phrasal operator by Heim (1985) based on the fact that Nenets robustly resists clausal standards, but has e.g. DP-external readings (cf. (2)). Although Nenets does not have overt morphological comparative marking on the adjective, the ablative marking on the standard of comparison licenses a covert phrasal operator.

In Chapter 3, I test predictions of the degree theory in combination with Hackl, Koster-Hale & Varvoutis (2012) for German attributive comparatives. Thus, after having established the analysis of the standard and determined which comparative operator German uses in Chapter 2, I look at processing of attributive comparatives in German. The more global goal of this plot is to test predictions that arise from the degree framework experimentally. Complexity differences derived from semantic theory make predictions for processing that I test in a number of studies: Results of a forced choice continuation study, Pilot 1, suggest that more complex structures are dispreferred. When a disambiguating context is added, which is the case in a subsequent acceptability rating study, Pilot 2, the preference seems to be overwritten. The context is also at play in online processing as a reading time study[2] reveals (cf. Berezovskaya & Hörnig 2019). An eye-tracking study that uses continuations of the form "...einer ist./...einen kennt." reveals a preview effect for the accusative continuation.

Finally, in Chapter 4, I will discuss variation in the differential argument of a comparative (cf. bold faced measure phrase in (4)) on the basis of a very specific example in which in Nenets the differential argument can be modified/restricted to small degrees.

(4) *Maria is **5cm** taller than Leo.*

[2]Henceforth this is often abbreviated as RT-study, cf. the index of abbreviation at the beginning of this thesis for all abbreviations used.

I will proceed in the following way: I will first situate Nenets on the linguistic map according to cross-linguistic parameters of Beck et al. (2009)[3]. Data from my original fieldwork show that this language has developed a grammar that integrates degrees into its semantics and also has abstraction over degrees (cf. Berezovskaya 2019). Crucially, Chapter 4 provides an analysis of a special feature of Nenets degree constructions, namely the *-rka*-suffix on the gradable adjective in comparison constructions (cf. example (3)) which I analyze as a modifier of the degree predicate and which essentially contributes the additional meaning that the differential degree is small. In the composition, I use the operation Degree Restriction in the spirit of Chung & Ladusaw (2004)'s RESTRICT that amounts to degree incorporation (compare this to noun in corporation in the sense of Chung & Ladusaw 2004). I thereby challenge claims in descriptive grammars according to which *-rka* is an optional comparative morpheme (cf. Terezhenko 1947 or Nikolaeva 2014).

Having set the scene and given an outlook for the thesis, I will now move on to the preliminaries and provide the theoretical background for the compositional framework employed (essentially that of Heim & Kratzer 1998), but also important aspects of degree semantics. I will also introduce the fieldwork methodology I apply in my work.

1.3 Preliminaries

The purpose of this section is to introduce the semantic framework used. Readers who are familiar with the theoretical background, might want to skip (some of) these sections.

1.3.1 Compositional Framework

The discussion in this dissertation is couched in the generative semantic framework of Heim & Kratzer (1998) unless specified otherwise. The system of Heim & Kratzer (1998) is structure-and type-driven, i.e. every interpretable node in the tree has a type. I will assume the following types throughout this thesis:

(5) a. **Simple types**
e individuals

[3] I will occasionally refer to this article as the B17-paper since the paper has evolved as as result of the work of project B17 in the Tübingen SFB (Collaborative Research Center) 441.

t	truth values
d	degrees
v	events
i	times

b. **Complex types**
If σ and τ are types, then $\langle \sigma, \tau \rangle$ is also a type. Nothing else is a type.

A crucial principle underlying the whole plot of the framework is the Principle of Compositionality attributed to Gottlob Frege (1848-1925). The principle states that the meaning of a sentence is determined by the meaning of its parts and the way in which the parts are combined (Frege 1892).

The syntactic phrase structure tree, the LF-syntax, serves as the input for semantic interpretation. The rules of composition from Heim & Kratzer (1998) are defined in the following. I write the semantic interpretation function (denotation brackets) as: $[\![.]\!]$.

(6) **Rules of Composition**

a. **Lexical Terminals** (Heim & Kratzer 1998: 95)
If α is a terminal node occupied by a lexical item, then $[\![\alpha]\!]$ is specified in the lexicon.

b. **Pronouns and Traces (PT)** (Heim & Kratzer 1998: 111)
If α is a pronoun or a trace, g is a variable assignment, and i $\in$ dom(g), then $[\![\alpha_{\mathrm{i}}]\!]^{\mathrm{g}} = g(i)$[4]

c. **Non-Branching Nodes (NN)** (Heim & Kratzer 1998: 105)
If α is a non-branching node and β its daughter, then, for any assignment g, α is in the domain of $[\![\ ]\!]^{\mathrm{g}}$ if β is. In this case, $[\![\alpha]\!]^{\mathrm{g}} = [\![\beta]\!]^{\mathrm{g}}$.

d. **Function Application (FA)** (Heim & Kratzer 1998: 105)
If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then, for any assignment g, α is in the domain of $[\![\ ]\!]^{\mathrm{g}}$ if both β and γ are, and $[\![\beta]\!]^{\mathrm{g}}$ is a function whose domain contains $[\![\gamma]\!]^{\mathrm{g}}$. In this case, $[\![\alpha]\!]^{\mathrm{g}} = [\![\beta]\!]^{\mathrm{g}}([\![\gamma]\!]^{\mathrm{g}})$.

e. **Predicate Modification (PM)** for individual predicates (Heim & Kratzer 1998: 105-106)
If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then, for any assignment g, α is in the domain of $[\![\ ]\!]^{\mathrm{g}}$ if both β and γ are, and $[\![\beta]\!]^{\mathrm{g}}$ and

[4] The assumption behind PT is that pronouns are variables. They have an index (i) and get their value via the variable assignment g, cf. definition in (7).

$[\![\gamma]\!]^{g}$ are both of type $\langle e,t\rangle$. In this case, $[\![\alpha]\!]^{g} = \lambda x : x \in D$ and x is in the domain of $[\![\beta]\!]^{g}$ and $[\![\gamma]\!]^{g}$. $[\![\beta]\!]^{g}(x) = [\![\gamma]\!]^{g}(x) = 1$.

f. **Predicate Abstraction (PA)** (Heim & Kratzer 1998: 186)
Let α be a branching node with daughters β and γ, where β dominates only a numerical index i. Then, for any variable assignment g, $[\![\alpha]\!]^{g} = \lambda x \in D.[\![\gamma]\!]^{g^{x/i}}$.

The interpretation of free variables also needs some attention here. It happens through the variable assignment function g, in (7). It assigns the relevant variable a contextually provided value of the same semantic type via g (cf. also PT in (6-b)).

(7) **Definition variable assignment**
A variable assignment is a partial function g from the set of indices to the set of all denotations, such that, for every $\langle i,\tau\rangle \in \mathrm{dom}(g)$, $g(i,\tau) \in D_{\tau}$.
(Heim & Kratzer 1998: 213)

The system just introduced is extensional, meaning that sentences denote a truth value in this system. The intensional framework used where necessary builds on von Fintel & Heim (2011).

1.3.2 Degree Constructions in the Standard Framework

I will start with some terminology.

(8) *Sue is 10 cm taller than Ned.*

In example (8), Sue is the **associate**, *10 cm* is the **differential degree**, *taller* is the **gradable adjective** and Ned is the **standard (of comparison)**. This is the terminology I am going to use throughout.

The theoretical framework that I use in my work is the standard degree analysis of comparatives as advocated by Cresswell (1976), von Stechow (1984), Heim (2001) and many others. A recent excellent overview of degree constructions in this framework is provided by Beck (2011). Below, I provide a brief theoretical background of relevant parts of degree semantics by first specifying my assumptions about degrees and then

turning to comparatives.

Theoretical Assumptions. The main assumptions about degrees that I will make throughout are the following:

- I rely on the **notion of degrees** as being an own semantic type d in the semantic ontology. Degrees are "highly abstract entities" (von Stechow 1984: 47). They are "equivalence classes generated by a comparative relation" (von Stechow 2008)[5]. Let us make precise what these abstract entities are: D_d, the denotation domain for d, is the union of the following disjoint sets (distances, weights, heights,...). These sets are accompanied by an ordering relation.

(9) SD := the set of all spatial distances
$>_{SD}$:= $\{< y, z >\in$ SD $\times$ SD: y is a greater spatial distance than z$\}$

(10) TD := the set of all temporal distances
$>_{TD}$:= $\{< y, z >\in$ TD $\times$ TD: y is a greater temporal distance than z$\}$

- The **notion of a scale** is also essential. Basically, degrees are points on a totally ordered scale. The definition (again cf. Beck 2011, p. 1343, from von Stechow 2005) is in (11).

(11) Call each such pair (X, $>_X$) a scale.
Properties of orders: $>_X$ is total on X, asymmetric, transitive, irreflexive.

- I assume that **gradable adjectives** like *tall*, *heavy* etc. are of type $\langle d, \langle e, t\rangle\rangle$, i.e. they relate individuals with sets of degrees (cf. von Stechow 1984, Beck 2011), like, for instance, the degrees of weight that they reach. Importantly, they introduce the degree into the semantics. A lexical entry is provided in (12). Note that the lexical entry contains a measure function μ (type $\langle e, d\rangle$), a partial function that assigns a unique degree to an individual an example of which can be found in (13).

(12) $[\![heavy]\!] = \lambda d : d \in D_d.\lambda x : x \in D_e.\mu_{\text{WEIGHT}}(x) \geq d$

(13) $[\![\text{WEIGHT}]\!] = \lambda x : x \in D_e.x's$ WEIGHT.

[5] The possibility to construct degrees as equivalence classes in type theory can be traced back to Whitehead & Russell 1910)

A simplified lexical entry that I also use is in (14).

(14) $[\![heavy]\!] = \lambda d.\lambda x.x$ is d-heavy

These are, of course, no innocent assumptions to make and there are contenders to this approach: on the other side of the spectrum there is Klein (1980,1991), among others, who takes the unmarked, positive form of the adjective as basic, does not include degrees into the ontology, but rather develops a context-dependent semantics for the adjective. There are also variants of the standard approach, like, for instance, Kennedy (1997), who assumes a different lexical entry for the positive form of the adjective and proposes a phrasal comparison operator that does not undergo movement and is not separated from the adjective as in our case. We will talk about this operator in detail in Chapter 2. The interested reader might consult Klein (1991) or Beck (2011) for further information on this topic.

Comparison Constructions. I will limit myself to the introduction of predicative and attributive comparative constructions to the exclusion of other degree constructions like equatives, superlatives etc. since these are not relevant for the present thesis.

I will start by what looks like a quite complex case, which, however, is the semantically most transparent case of a comparative, namely a subcomparative (SubC). The following example needs to be imagined in a Tübingen context: the reader should know that Tübingen is one of very few cities in the world that has punts which can be seen on the beautiful Neckar river during the warm seasons of the year. When passing under the Neckar bridge, one could say, for the fear of the punting pole getting stuck:

(15) *The punting pole is longer than the bridge is high.*
"The maximal degree of length that the punting pole reaches exceeds the maximal degree of height that the bridge reaches."

How do we arrive at the paraphrase provided and what is the syntax and semantics of (15)? The desired truth conditions are:

(16) $\textsc{max}(\lambda d.$ the punting pole is d-long$) > \textsc{max}(\lambda d'.$ the bridge is d'-high$)$

The ingredients that are needed in the composition and have not been introduced so far

are (i) the comparative operator, let's call it COMP and (ii) the maximality operator, MAX.

The comparative operator provides us with a relation that compares, for instance, two sets of degrees, the '>' relation; semantically, it acts separately from the adjective it morphologically combines with, as shown in the structures in (19) and (20). The sub-comparative in (15) shows that both the main clause and the *than*-clause make available those degrees. The meaning that we will assume for the comparative morpheme is in (17). It takes two sets of degrees (provided by the matrix and the standard clause) and relates them to each other:

(17) $[\![\text{COMP}_{(\text{clausal})}]\!] = \lambda D'_{\langle d,t\rangle}. \lambda D_{\langle d,t\rangle}. \text{MAX}(D) > \text{MAX}(D')$

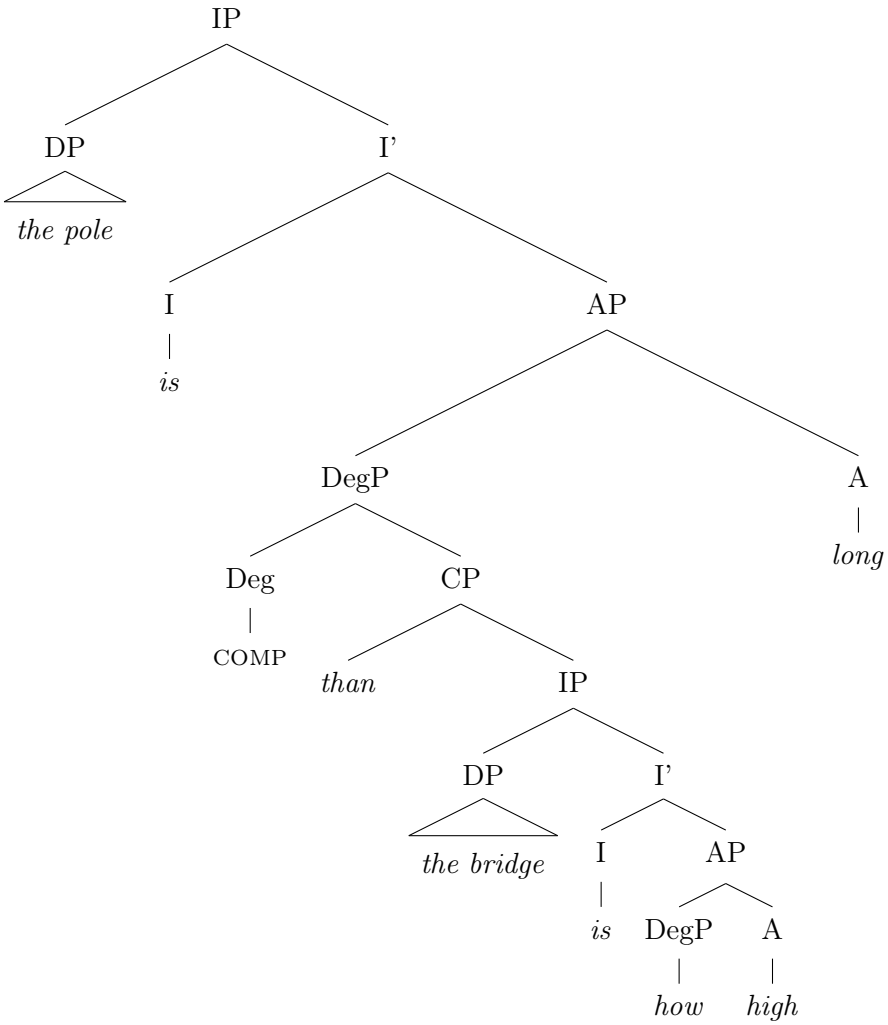
I will call this comparative operator $\text{COMP}_{\text{clausal}}$, since it relates two degree clauses with each other. We use the maximality operator defined in (18):

(18) $[\![\text{MAX}]\!] = \lambda D_{\langle d,t\rangle}. \iota d\ [D(d)\ \&\ \forall d'\ [D(d') \rightarrow d' \leq d]]$

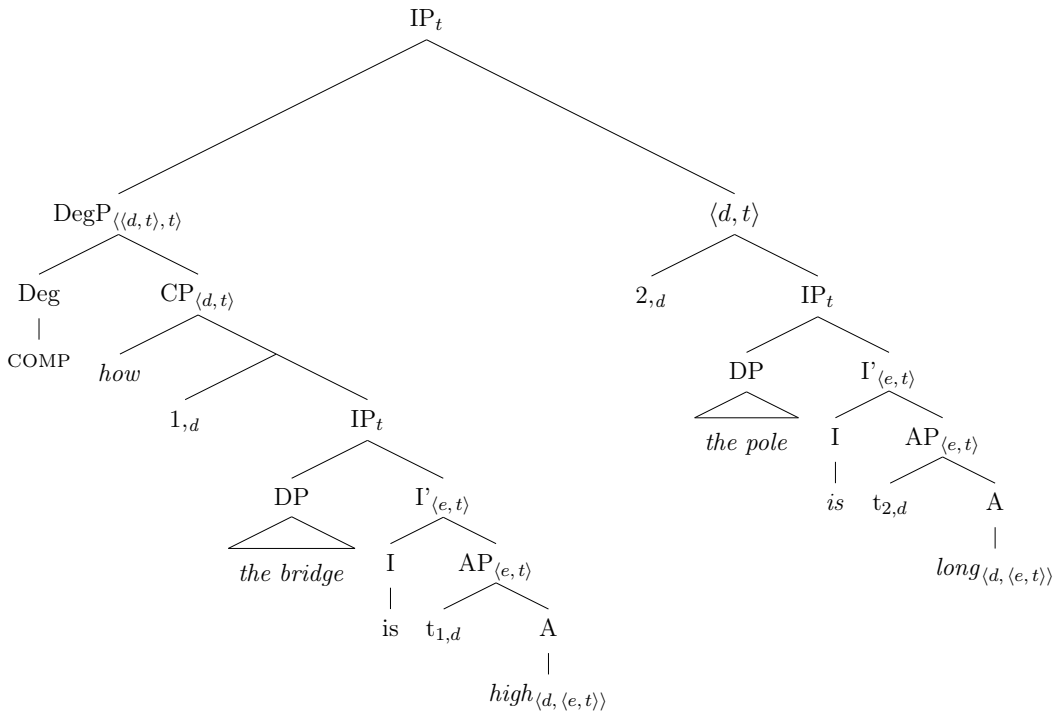
The main job of the maximality operator is to pick a unique degree of which the predicate is true and make sure that all other degrees of which the predicate is true are smaller than or equal to that unique degree.

The presented syntax goes back to Bresnan (1973). The underlying structure and the LF are in (19) and (20), respectively.

(19) Underlying structure for (15)



(20) LF for (15)



The comparative morpheme and the *than*-clause form a constituent at LF. The composition of (20) works in the following way: the DegP of the matrix clause is QRed to avoid type mismatch. This creates predicate abstraction over a degree variable. The *than*-clause is a *wh*-clause with a degree gap which is created by *wh*-movement of the silent *how*. This way, the generalized quantifier over degrees has two degree sets to work with. The composition is provided in (21).

(21) a. ⟦ [2 [the pole is [$_{\text{AP}}$ t$_2$ long]]] ⟧ = [λd. the pole is d-long]

b. ⟦ [how [1 the bridge is t$_1$ high]] ⟧ = [$\lambda d'$. the bridge is d'-high]

c. ⟦ [[$_{\text{DegP}}$ COMP [than [how [1 the bridge is t$_1$ high]]]] [2 [the pole is [$_{\text{AP}}$ t$_2$ high]]]] ⟧ = 1 iff

Now we apply COMP to both terms (first a.), then b.)) via **FA** and get:

MAX(λd. the pole is d-long) > MAX($\lambda d'$. the bridge is d'-high)

1.3.2.1 Previous Cross-linguistic Research on Comparatives

The cross-linguistic investigation of degree constructions is a thriving topic in descriptive and other linguistic literature. To this day, a large body of work dedicated to this topic has evolved. A crucial contribution is Stassen's (1985) "Comparison and Universal Grammar". Typologically oriented studies include Ultan (1972) and Bobaljik (2012). These investigations rather concentrate on the morpho-syntactic characteristics of comparison constructions, predicates and gradability in the world's languages. Yet, only rather recently have researchers started to look at the topic from a formal theoretical perspective in general and formal semantic perspective in particular. A major contribution to this has been provided by Beck, Oda & Sugisaki (2004) and Beck et al. (2009).

There is also a growing body of work on degree constructions in individual languages. For instance, there is work by Galant (1998) on Spanish and San Lucas Quiaviní Zapotec, by Hohaus (2010) & Hohaus (2012) on Samoan, by Pearson (2010) on Fijian, by R. Bochnak (2013) on Washo, by Bowler (2016) on Warlpiri, by Bogal-Allbritten (2013) on Navajo, by Howell (2012) on Yorùbá, by Berezovskaya (2014) on Russian, to name but a few. A recent overview over the empirical landscape of degree constructions cross-linguistically and analytical approaches that have been followed to account for the different languages can be found in Hohaus & M. R. Bochnak (2020).

Coming back to the parameters by Beck et al. (2009), the authors have investigated a total of 17 languages from different language families, some of which are underrepresented in formal semantic literature. The authors identify three dependent parameters in the grammar of degree constructions which I will now briefly introduce.

(22) **Degree Semantics Parameter (DSP)**, cf. Beck et al. (2009): A language {has}/{doesn't have} gradable adjectives (of the semantic type $\langle d, \langle e, t\rangle\rangle$) and related.
Example: Are there predicates such as $[\![tall]\!] = [\lambda d.\lambda x.\textsc{height}(x) \geq d]$ in the language that introduce a degree into the semantics?

(23) **Degree Abstraction Parameter (DAP)**, cf. Beck, Oda & Sugisaki (2004): A language {has}/{doesn't have} binding of degree variables in the syntax.
Example: Is there a LF with the following constellation:
[$\text{DegP}_{\langle\langle d,t\rangle,t\rangle}$ [$\lambda d.$ [...t_d...]]]

(24) **Degree Phrase Parameter (DegPP)**, cf. Beck et al. (2009): A language {can}/ {cannot} overtly fill the degree argument position of a gradable predicate.

The DSP amounts to systematic variation in the lexicon of any given grammar. It basically asks whether or not the language has degree-introducing expressions and thus also degrees in its grammar. The second parameter DAP goes back to Beck, Oda & Sugisaki (2004). The constellation in the example under (23) shows that a degree quantifier moved out of its base position thus creating an abstraction over degrees, i.e. a degree predicate. The dependence between the DSP and the DAP is evident: a language can only have abstraction over degrees if it has degrees in its ontology in the first place. In the case of the DEGPP, the degree argument position (Spec,AP under our syntax) is filled by a Measure Phrase (MP) at the surface in MP-constructions like '6 feet tall', by overt or silent *how* or its kin in Degree Questions (DegQ) (cf. (31) and (32) below) subcomparatives (SubC) in (15). This brings me to the clusters found by B17, according to which the availability of certain constructions is indicative of the parameter settings. The following constructions clustered together when considering the question of whether a language has a family of expressions that plausibly refer to degrees and combine with degree operators. I give two relevant examples in (25-a) and (26-a) below with the sentence in (a), a paraphrase in (b) and the LF in (c).

(25) a. *Fabi is taller than 1.80m.* COMPARISON TO A DEGREE (COMPDEG)
b. The maximal height degree that Fabi reaches exceeds 1.80m.
c. [[$\text{DegP}_{\langle\langle d,t\rangle,t\rangle}$ COMP than 1.80m] $[_{\langle d,t\rangle}$ 1 [Fabi is $t_{1,d}$ tall]]]

(26) a. *Simon is 10cm taller than Anne.* DIFFERENTIAL COMPARATIVE (DIFFC)
b. The maximal degree of height that Simon reaches is 10 cm plus the maximal degree of height that Anne reaches.
c. [IP [$\text{DegP}_{\langle\langle d,t\rangle,t\rangle}$ [10cm] [COMP [than how_1 [Anne is $t_{1,d}$ tall]]]] $[_{\langle d,t\rangle}$ 2 [Simon is $t_{2,d}$ tall.]]][6]

[6]Note that the composition in the *than*-clause requires a different degree operator here in order to accommodate the differential degree slot. For purposes of exposition I assume a referential type d for the measure phrase 10 cm. There are accounts that treat the measure phrase as a quantifier (type $\langle\langle d,t\rangle,t\rangle$). This is not of importance here, but see Beck (2011) for discussion and further references on this particular issue.

CompDeg and DiffC clustered together in the B17 study. They are taken to be diagnostics for the positive setting of the Dsp. An example of a language that has the negative setting of the Dsp is Motu which uses the conjunctive strategy in (27) to express a comparison[7].

(27) *Mary na lata to Frank na kwadogī.*
Mary top tall but Frank top short
'Mary is taller than Frank.' (Beck et al. 2009: 18, ex. (59))

Other expressions that refer to degrees or manipulate degrees, like MPs or DegQs are missing from the language as well. B17 interpret that as missing degree semantics in Motu and suggest the following context-dependent semantics (in the spirit of Klein 1980):

(28) a. $[\![tall_{\text{Motu}}]\!] = [\lambda c.\lambda x.$ x counts as tall in c$]$
b. $[\![short_{\text{Motu}}]\!] = [\lambda c.\lambda x.$ x counts as short in c$]$
c. $[\![(27)]\!]^{\text{C}} = 1$ iff
Mary counts as tall in c and Frank counts as short in c

Based on variation between English and Japanese, Beck, Oda & Sugisaki (2004) observe that Japanese is missing English-like negative island effects like in (29), where negation in the *than*-clause leads to unacceptability.

(29) **Mary bought a more expensive book than nobody did.*

Negative Island Effect (NegIs)

Beck, Oda & Sugisaki (2004) also note that, in contrast to English there are no scope interactions in examples with comparatives and modal verbs in Japanese. I will illustrate such a scope ambiguity by using English. Heim (2001) observes for English that examples like the following have two readings:

[7] Over the past years, this line of research has been continued. The following languages have been investigated with respect to the question whether they introduce degrees. Here is a collection of possibly "degree-less" languages: Fijian in Pearson (2010), Washo in R. Bochnak (2015), Warlpiri in Bowler (2016), Mainland Comox (aka Sliammon) in Reisinger & Lo (2017) and Nez Perce in Deal & Hohaus (2019). The matter of a language having or not having degrees is a much more complex one and I therefore refer the interested reader to these references.

(30) (**Context**: The draft is 10 pages). *The paper is required to be exactly 5 pages longer than that.* (Heim 2001: 224, ex. (28))

a. [exactly 5pp COMP than that] [1 required [the paper be $t_{1,d}$ long]]
MAX($\lambda d.\forall w \in Acc$[8] $\rightarrow$ the paper is d-long in w) = 15pp
'The minimum length required for the paper is 15 pages.'

"MINIMUM REQUIREMENT READING "

b. required [[exactly 5pp COMP than that] [1 the paper be $t_{1,d}$ long]]
$\forall w \in Acc \rightarrow$ MAX(λd. the paper is d-long in w) = 15pp
'The paper is exactly 15 pp long in every acceptable world.'

This type of ambiguity shows that for English, it is plausible to assume that DegPs are real quantifiers (for discussion on the constraints of quantifier movement of comparatives, cf. Beck 2011: 1363). Beck et al. (2009) take NEGIS and SCOPE as diagnostics for the setting of the DAP. Since English displays NEGIS and SCOPE, it has [+DAP] while Japanese has [-DAP].

Finally, the DEGPP-parameter evolved since SubCs, MPs and DegQs clustered together. We have already seen an example of a SubC in (15) along with its analysis. I illustrate the example sentence in a.), the syntax in b.), the LF in c.) and a paraphrase of the truth conditions in d.) for the MP in (31), the DegQ in (32) and the SubC in (33).

(31) a. *Carla is exactly 1.70m tall*[9]. MP
b. [Carla is [$_{\mathbf{AP}}$ [exactly 1,70m] [$_{\text{A}}$ tall]]]
c. [[DegP$_{\langle\langle d,t\rangle,t\rangle}$ exactly 1.70m] [$_{\langle d,t\rangle}$1 [Carla is $t_{1,d}$ tall]]]
d. The maximal height degree that Carla reaches is 1.70m.

(32) a. *How tall is Carla?* DEGQ
b. [Carla is [$_{\mathbf{AP}}$ how [$_{\text{A}}$ tall]]]
c. [Q [$_{\langle d,t\rangle}$ how$_1$ [Carla is $t_{1,d}$ tall]]]
d. For which degree d: Carla is d-tall?

[8] Acc(w): the set of worlds accessible from w

[9] Examples like 'Peter is 5 feet tall.' will often be referred to here as MPs, too. In the literature, this type of MP is often called "direct measure phrase" and their (non-)availability is subject to cross-linguistic variation. There is also a debate as to whether those direct MPs should be treated as a generalized quantifier over degrees, i.e. as being of type $\langle\langle d,t\rangle,t\rangle$ and not just referring to a degree, i.e. being of type d (cf.e.g. Schwarzschild 2005 and a discussion of Schwarzschild 2005 in Beck 2011).

(33) a. *The table is higher than the commode is wide.*
b. The table is higher [than [how$_1$ [the commode is [$_{\mathbf{AP}}$ t$_1$ [A wide]]]]]
c. MAX(λd. the table is d-high) > MAX($\lambda d'$ the commode is d'-wide)
d. The maximal degree of height that the table reaches exceeds the maximal degree of width that the commode reaches.

English has all three constructions in its grammar, i.e. the Spec,AP is filled in every case, by a measure phrase in (31), a *wh*-word in (32) and by a trace in (33) (or (15)). For many languages that Beck et al. (2009) investigated, this is, however, not true. The following table summarizes the patterns found by B17 for the investigated languages:

Lang\ Constr.	**DiffC**	**CompDeg**	**NegIs**	**Scope**	**DegQ**	**MP**	**SubC**	**Parameter setting**
Motu		no	n.a.	n.a.	no	no	n.a.	[-Dsp], [-Dap], [-DegPP]
Japanese	yes	%	no	no	no	no	no	
Chinese	yes	yes	no	no	no	no	no	[+Dsp],
Mooré	yes	yes	n.a.	no	no	no	n.a.	[-Dap],
Samoan	yes	yes	n.a.	no	no	no	n.a.	[-DegPP]
Yorùbá	yes	yes	n.a.	no	no	no	n.a.	
Russian	yes	yes	yes	yes	no	no	no	
Turkish	yes	yes	n.a.	yes	no	no	n.a.	[+Dsp],
Guaraní	yes	yes	yes	yes	no	no	no	[+Dap],
Romanian	yes	yes	yes	yes	(no)	(no)	(no)	[-DegPP]
Spanish	yes	yes	yes	yes	(no)	(no)	(no)	
English	yes	yes	yes	yes	yes	yes	yes	
German	yes	yes	yes	yes	yes	yes	yes	[+Dsp],
Bulgarian	yes	yes	yes	yes	yes	yes	yes	[+Dap],
Hindi-Urdu	yes	yes	n.a.	yes	yes	yes	n.a.	[+DegPP]
Hungarian	yes	yes	yes	yes	yes	yes	yes	
Thai	yes	yes	yes	yes	yes	yes	yes	

Table 1.1: Cross-linguistic Variation and Parameter Setting of B17-Study

In Table 1.1, n.a. means not applicable, (no) indicates that there is some rescue strategy in the language. These parameters help to situate any given language on the cross-

linguistic map and to determine in how far a language has developed a grammar of degrees. I will clarify the parameter setting of Tundra Nenets in Chapter 4. Some follow-up studies have refined or even questioned the dependence of the parameters: e.g. Tiemann, Hohaus & Beck (2012) who discuss whether the DegPP is really dependent on Dap based on observations of L1 acquisition of pronominal measure phrases in English and German children.

1.3.3 Empirical Perspectives

In my thesis, I use two kinds of methodology, namely fieldwork and experiments in order to uncover and explain the variation in the standard of comparison and in the differential argument and gain empirical evidence for our theory. As we will see, these elements are fundamental for building theories that cover the full empirical range of the phenomena discussed.

Krifka (2011) lays out different types of semantic evidence. He refutes Bloomfield's (1933) claim that the "[...] statement of meanings is [...] the weak point in language-study, and will remain so until human knowledge advances very far beyond its present state." by responding: "Despite Bloomfield's qualms, the field of semantics has flourished. Where he went wrong was in believing that we have to consider the whole world of the speaker, or the speaker's whole brain. There are ways to cut out phenomena that stand in relation to, and bear evidence for, meanings in much more specific ways." (Krifka 2011: l.128ff) With this thesis, I contribute fieldwork and experimental data that lead to a better understanding of how comparatives work.

1.3.3.1 Fieldwork Methodology

In this subsection, I will briefly introduce the semantic fieldwork methodology that I used and provide details about the loci, informants and dates of my fieldwork trips.

Fieldwork Methodology. I used translation tasks for my elicitation. As one of the central and widely acknowledged method of semantic fieldwork, I quite extensively use acceptability judgment tasks as described in Matthewson (2004), Matthewson (2011), Bowern (2015), Krifka (2011) and Chelliah & de Reuse (2011). I also make frequent use of picture contexts and sometimes storyboards.[10]

[10] A great source for storyboards are totem field storyboards which are available under: `http://totemfieldstoryboards.org/`. A new resource is the Fielwork Hub: Tübingen Elicitation Ma-

Information on my Fieldwork. All the data on Tundra Nenets stems from original fieldwork conducted during four fieldwork trips unless stated otherwise. I conducted my first fieldwork trip in February and March 2014 to Arkhangelsk and St. Petersburg. In September 2014, I ventured out to Naryan-Mar, the capital of the Nenets Autonomous Okrug (NAO) where my primary informant lives. In September 2015 a trip to St. Petersburg followed. In September 2016 I went back to Naryan-Mar. The following map illustrates my loci of fieldwork[11]:

Figure 1.2: Loci of my Fieldwork.

In Arkhangelsk, I worked with three informants, among them my wonderful primary informant Roza Ivanovna Kanjukova who provided me with many invaluable contacts of further informants. St. Petersburg was suitable for work with informants because

terials for Linguistic Fieldwork available under `https://fieldworkhub.wordpress.com/`.

[11] Source of the map: `http://www.wissenladen.com/maps/map.php?Russia_(Arkhangelsk)&id=179&ln=en`

the Herzen State Pedagogical University[12] has a department called the Institute of the Peoples of the North[13]. This is the only institution of higher education in Russia who prepares future students of Northern minority languages for teaching and research. I had the opportunity to work with students of this institute who came mostly from the Yamal region. My main headquarters, Naryan-Mar, was the place where most of my informants live. In total, I have been working with 19 informants. The informants were predominantly female (17 female and 2 male informants) their ages ranging between 19—77 years (mean age: 44 years). All my informants speak both Nenets and Russian. Some of them were exposed to Russian only after the age of six. My language consultants speak different subdialects of Tundra Nenets: In Nar yan-Mar and Arkhangelsk my language consultants spoke the subdialects of Bol'shaya Zemlya and Malaya Zemlya, but also the subdialects of the Kanin Peninsula and the Kolguyev Island. My student consultants from the Herzen University were mainly representatives of the Yamal dialect. According to my research, dialectal variation is not important and also not relevant in the grammar of comparatives. Therefore, I standardize the dialectal forms in my examples so that the written norm is usually chosen over the dialectal one.

The meta language that I used during all elicitation sessions with my informants was Russian and the object language was, of course, Nenets. In acceptability judgment tasks, the context that was given before the target sentence was often given in Russian and the following linguistic expression (the target sentence) was then given in Nenets (cf. Matthewson 2004 where she discusses the possibility of using the meta language for the context and the object language for the sentence). This additional complication should be kept in mind and will be mentioned at some occasions where relevant in the thesis.

1.3.3.2 Experimental Methodology

Experimental methods in linguistics are a well-established and great tool to test predictions our theory makes. The scientific method of observing, questioning, forming a hypothesis and finally testing the predictions that can be derived from the hypothesis is at the core of the research program I am following in this thesis. I will briefly comment on the experimental paradigms I have been using for my study in Chapter 3. I conducted a forced-choice experiment, an acceptability rating experiment, a reading time (RT) experiment and an eye-tracking experiment (the latter in cooperation with Fabian Schlotterbeck and Oliver Bott).

[12]To be found here: `https://www.herzen.spb.ru/en`
[13]To be found here: `https://www.herzen.spb.ru/main/structure/inst/ins/`

In my first pilot study, Pilot 1, I used a **forced-choice task** to figure out a preference for a disambiguated sentence when presented without context. In Pilot 2, I used an **acceptability rating study** to enforce a certain reading by providing a context in advance. Pilot 2 was also thought of as a pilot for the self-paced RT-experiment in order to establish whether the contexts did their job, i.e. disambiguated a sentence towards one or the other reading.

Reaction times are a good window into semantic processing. I used a **self-paced reading study** with a moving-window technique. According to Rayner & Clifton (2002), such a self-paced reading test is more precise as compared to only measuring overall reading times. One can control the amount of text and the size of the segment that the subject can see at once. This was of importance for my investigation since I am interested in exactly where and how fast the ambiguity is resolved. The comparison of one reading being quicker than the other at a certain point is helpful to establish processing difficulties and thus complexity of one over the other structure. Longer reaction times are a sign of higher processing cost.

Finally, I also applied **eye tracking**. The ambiguity that I was interested in, cf. example (13), turned out to be a subtle one when it comes to testing it experimentally. Thus, a fine-grained method was called for in order to better test my prediction of one reading being more complex than the other in several respects. As Rayner & Clifton (2002) put it:

> Eye movements have been utilized to study a variety of language comprehension processes, and data gleaned from eye-tracking studies have been found to reflect moment-to-moment cognitive processes. One early finding was that where readers look and how long they look there is directly related to the ease or difficulty of cognitive processing [...]
>
> (Rayner & Clifton 2002: 265)

We measured first pass time, first pass regression ratios, regression path duration and total times. However, only in the first pass regression ratios did we find a significant interaction that was predicted. I will describe and discuss all the experiments in detail in Chapter 3.

Chapter 2

Variation in the Standard Argument

> The precise semantics of the comparative operator is of course the object of much debate [...]
>
> (Beck 2011: 1342)

> Strong arguments have been brought forth for the view that the comparative constructions of different languages employ different compositional mechanisms. The semantics of the comparative operator used thus has to be determined on a case-by-case basis. [...] Thus, we are faced with the problem of determining, for a given comparative construction, which comparative operator and corresponding path of composition this construction uses.
>
> (Beck, Hohaus & Tiemann 2012: 147)

Inspired by this line of research, this chapter provides a cross-linguistic discussion of comparative operators. In addition to what is already known from the literature about other languages like English, German, Greek and Hindi, I also investigate Russian and Tundra Nenets.

The overarching research question of this chapter is **Q1**, namely:
Q1: What is the range of available degree operators cross-linguistically? In particular:
a. Do we see evidence for both phrasal operators described in the literature ($\text{COMP}_{Heim1985}$ and $\text{COMP}_{Kennedy1997}$)?
b. Or do we only need the stronger one ($\text{COMP}_{Heim1985}$) that covers a wider range of constructions?

The hypotheses repeated in short from 1.1 for Russian ($H1_R$), German ($H1_G$) and Nenets ($H1_N$) are the following:

$H1_R$: Genitive-marked synthetic comparatives in Russian use $\text{COMP}_{Kennedy}$.

$H1_N$: Nenets uses COMP_{Heim}

$H1_G$: German only has $\text{COMP}_{\text{clausal}}$

The research contribution of this chapter is that I provide novel analyses of comparison constructions in **Russian** and **Tundra Nenets** thereby contributing to the question of the exact inventory of comparative operators. In this chapter, I also provide a little roadmap, summarized in a flowchart, of how to analyze the standard argument when faced with a new research language. Russian genitive-marked comparatives are analyzed as involving a phrasal comparative operator that goes back to Kennedy (1997), $\text{COMP}_{Kennedy}$, while *čem*-clauses (a *wh*-word marked by instrumental case) are best analyzed as using the clausal comparative operator $\text{COMP}_{\text{clausal}}$. Nenets comparatives are analyzed as using a phrasal operator going back to Heim (1985), COMP_{Heim}. The main distinction between the two operators is their scopal mobility.

In order to deal with the overarching question **Q1**, I will also think about (i) what the different compositional routes to the same meaning there are, and (ii) which evidence in favor of these different operators we have in the languages under discussion. In the following theoretical background, I will first discuss the difference between the so-called "phrasal" and "clausal " analyses in subsection 2.1.1 and then discuss the different operators that are on the market in subsection 2.1.2, briefly introduce the Bhatt & Takahashi diagnostics in subsection 2.1.3 and finally elaborate on the inventory of different operators cross-linguistically in subsection 2.1.4. I will subsequently turn to comparison operators in Russian in 2.2[1], then Nenets in in 2.3 and finally German in 2.4 and apply the diagnostics introduced in section 2.1.4.

2.1 Theoretical Background

2.1.1 Phrasal and Clausal Analysis of Comparatives

The focus of Chapter 2 are clausal vs. phrasal operators cross-linguistically. First, let us define what we mean by "clausal" and "phrasal". The following English comparatives are all clausal:

[1]Parts of this section have been published in Berezovskaya & Hohaus (2015).

(1) a. *Peter has more pets* [*than he has children*].
b. *Today it is hotter* [*than I thought*].
c. *It is more humid today* [*than ~~it was humid~~ yesterday*].
d. *Jenny is taller* [*than Sophia is ~~tall~~.*]

Just like the subcomparative in (15) in Chapter 1, these clausal comparatives, quite straightforwardly, involve a CP-complement to the preposition *than*, with a *wh*-operator in Spec,CP (index 1_d in (20)) which binds a degree variable in the gradable predicate. The gradable predicate is elided under identity with the matrix predicate – a phenomenon known as Comparative Deletion (Bresnan 1973). We get the following LF and PF for (1-d):

(2) a. LF: Jenny is taller [$_{\text{PP}}$ than [$_{\text{CP}}$ how$_1$ Sophia is d_1-tall]]
b. PF: Jenny is taller [$_{\text{PP}}$ than [$_{\text{CP}}$ ∅ Sophia is ~~d_1-tall~~]]

All the examples in (1) can be straightforwardly analyzed when using the clausal operator introduced in (17) in Chapter 1 and repeated below in (50), since both the matrix and the standard clause (in square brackets) clearly provide us with a clause. But what about the example in (4)?

(3) $[\![\text{COMP}_{(\text{clausal})}]\!] = \lambda D'_{\langle d,t\rangle}.\, \lambda D_{\langle d,t\rangle}.\, \text{MAX}(D) > \text{MAX}(D')$

(4) *Jenny is taller* [*than Sophia*].

Compared to (1-d), there is nothing in (4) following the standard of comparison, the DP 'Sophia'. There are two possible analyses of this case: The **Reduction Analysis** (c.f. Heim 1985, Lechner 2001) holds that phrasal comparatives are underlyingly clausal. This fact is masked by ellipsis. On this view, (4) has the LF in (2-a), but at PF more material is elided, namely ~~is d_1-tall~~.Thus, we are left with just a DP, but only superficially[2]. The **Direct Analysis** (c.f. Hankamer 1973 i.a.) holds that in phrasal comparatives nothing is elided at all; rather, *than* has a DP complement, as in (5).

[2]Under the Reduction Analysis, differing agreement morphology in the matrix vs. the *than*-clause does not play any role for identity at LF and thus does not pose any obstacle for the ellipsis:
(i) *I am taller than the children ~~are~~.*

(5) LF and PF: Jenny is taller [$_{\text{PP}}$ than [$_{\text{DP}}$ Sophia]]

For the composition under the Phrasal Analysis this means that $\text{COMP}_{\text{clausal}}$ is not going to work since it does not get as its argument a clause to operate on, but only an individual. A different operator is called for, namely a phrasal one. This leads me to my next section, phrasal operators in the literature.

2.1.2 Different Phrasal Operators

Not all comparatives might be amenable to a clausal analysis that uses the clausal operator. As we will see in a bit, Russian is a language where we have two types of comparatives: One type is clearly in need of the clausal and the other of the phrasal operator. We will need both the Reduction and the Phrasal Analyses.

When assuming the Phrasal Analysis, a phrasal comparative operator is needed. There are three phrasal operators on the market, namely the COMP_{Heim} by Heim (1985) in (6), $\text{COMP}_{Kennedy}$ by Kennedy (1997) in (7) and $\text{COMP}_{Merchant}$ by Merchant (2009).

(6) $[\![\text{COMP}_{\text{Heim}}]\!] = \lambda y_e.\, \lambda R_{\langle d,\langle e,t\rangle\rangle}.\, \lambda x_e.\, \text{MAX}(\lambda d.\, R(d)(x)) > \text{MAX}(\lambda d'.\, R(d')(y))$
(Heim 1985, Bhatt & Takahashi 2011a)

(7) $[\![\text{COMP}_{\text{Kennedy}}]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}.\, \lambda y_e.\, \lambda x_e.\, \text{MAX}(\lambda d.\, R(d)(x)) > \text{MAX}(\lambda d'.\, R(d')(y))$
(Kennedy 1997)

(8) $[\![\text{COMP}_{\text{Merchant}}]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}.\, \lambda x_e.\, \lambda y_e.\, \text{MAX}(\lambda d.\, R(d)(x)) > \text{MAX}(\lambda d'.\, R(d')(y))$[3]
(Merchant 2009)

The crucial difference between Kennedy's and Merchant's operator is the Schönfinkelization[4] of the standard and the associate. In the case of Merchant's operator, the associate (represented by x) comes directly after the gradable relation and is then followed by the standard of comparison (represented by y). For Kennedy, the order in which the comparison operator is provided with the standard and the associate is reversed: it first takes

[3] This lexical entry is modified from Merchant's original lexical entry in Merchant (2009): 157 to make it comparable to the other two. For more on this issue, cf. also Hohaus & M. R. Bochnak (2020).

[4] This procedure is also known as "Currying" after the logician H.B. Curry. It can be described as turning an n-ary function into multiple embedded 1-ary functions.

the gradable relation, then the standard of comparison and then the associate. I will not look into Merchant's comparative operator in this thesis and only compare Heim's and Kennedy's operators, but I still added it here for the sake of completeness.

Let us now compare (6) and (7). The only but crucial difference is again the Schönfinkelization of the arguments: while Heim's operator first takes an individual, then the relation provided by the gradable predicate and then another individual, Kennedy's operator first takes the relation and then two individuals. There is no difference in the resulting truth conditions for both phrasal operators applied to the English example in (4). However, the pathway towards these truth conditions, i.e. the composition is quite different, as I illustrate in (9) and in (10).

(9) a. [Jenny [is [tall $\text{COMP}_{Kennedy}$ [than Sophia]]]]

b. $[\![\ tall\ \text{COMP}_{Kennedy}]\!] = \lambda y.\lambda x.\text{MAX}(\lambda d.\text{HEIGHT}(x) \geq d) > \text{MAX}(\lambda d'.\text{HEIGHT}(y) \geq d')$

c. $[\![tall\ \text{COMP}_{Kennedy}]\!]([\![Sophia]\!])([\![Jenny]\!]) = 1$ iff $\text{MAX}(\lambda d.\text{HEIGHT}(Jenny) \geq d) > \text{MAX}(\lambda d'.\text{HEIGHT}(Sophia) \geq d')$

(10) a. [Jenny [is [COMP_{Heim} than Sophia] [2 [1 [$t_{1,e}$ $t_{2,d}$ tall]]]]]

b. $[\![\ [\text{COMP}_{Heim}\ \ than\ Sophia]\ ]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.\text{MAX}(\lambda d.R(d)(x) > \text{MAX}(\lambda d'.R(d')(Sophia))$

c. $[\![[2[1[t_{1,e}t_{2,d}\ tall]]]]\!] = \lambda d.\lambda x.\text{HEIGHT}(x) \geq d$

d. $[\![[\text{COMP}_{Heim}\ \ than\ Sophia]]\!]\ ([\![\ [2[1[t_{1,e}t_{2,d}\ tall]]]]\!])([\![Jenny]\!]) = 1$ iff $\text{MAX}(\lambda d.\text{HEIGHT}(Jenny) \geq d) > \text{MAX}(\lambda d'.\text{HEIGHT}(Sophia) \geq d')$

The LFs are already crucially different, cf. (9-a) and (10-a): the simpler LF is (9-a), since the Kennedy operator does not require the separation of the comparative operator and the gradable predicate. This is different in (10-a), since here we need to syntactically recreate the gradable relation via parasitic movement (cf. Heim 1985, Beck & Sauerland 2000) after having separated the operator from its adjective.[5] In (10-a), the index 1 stems for the moved associate, namely 'Jenny'. At this point in the calculation, we get

[5] Note that here, in this predicative case, the two movements that create the parasitic movement are actually not needed according to the principle of Scope Economy (cf. Fox 1995, Fox 2000). We could also have the LF which just corresponds to the underlying structure: [Jenny [is [COMP_{Heim} than John] tall]]. This gives us the same outcome in the truth conditions. However, the crucial thing is that, contrary to Kennedy's operator, we CAN have the movement with Heim's operator and we do need it for certain cases, like attributive comparatives which will be the topic of discussion later on.

abstraction over individuals thus creating a predicate of type $\langle e, t\rangle$. Index 2 is produced by the movement of the DegP, 'COMP_{Heim} than Sophia'. This second abstraction yields the syntactically derived relation $\langle d, \langle e, t\rangle\rangle$.

Beck, Hohaus & Tiemann (2012) show that this difference in Schönfinkelization matters not only for the composition of an example of a phrasal comparative like (4), but also for other matters: both phrasal operators can derive a predicative comparative, but according to the authors, Kennedy's operator (i) cannot interact scopally with other operators (i.e. only has narrow scope in ambiguous examples like (30) from Chapter 1 and (ii) cannot derive attributive or adverbial readings at all (cf. Beck, Hohaus & Tiemann 2012: 153 for details). Among the phrasal operators, only Heim's can deal with attributive cases. As to the relevant constructions (relevant for me; Beck, Hohaus & Tiemann 2012 talk about more operators and more data, e.g. Negative Island Effects), Table 2.1 provides a summary of what the three operators (the clausal and both phrasal ones) {can}/{cannot} do when we compare them according to Beck, Hohaus & Tiemann (2012).

	-pred-	-attr-	-ScopMob-[6]
$\text{COMP}_{\text{clausal}}$	Yes.	Yes.	Yes.
COMP_{Heim}	Yes.	Yes.	Yes.
$\text{COMP}_{Kennedy}$	Yes.	**No.**	**No.**

Table 2.1: Distribution of COMP_{Heim} vs. $\text{COMP}_{Kennedy}$

2.1.3 Bhatt and Takahashi's (2011a,b) Diagnostics

Bhatt & Takahashi (2011a) provide the following scope ambiguity that helps to distinguish between the clausal operator and COMP_{Heim}[7].

(11) *More people read every syntax paper than every semantics paper.*

a. Reading 1: [[$\text{COMP}_{\text{clausal}}$ [than [$\lambda d.d$-many people read every semantics paper]]] [$\lambda d.d$-many people read every syntax paper]]

[6] -ScopMob- stands for scopal mobility of the operator.

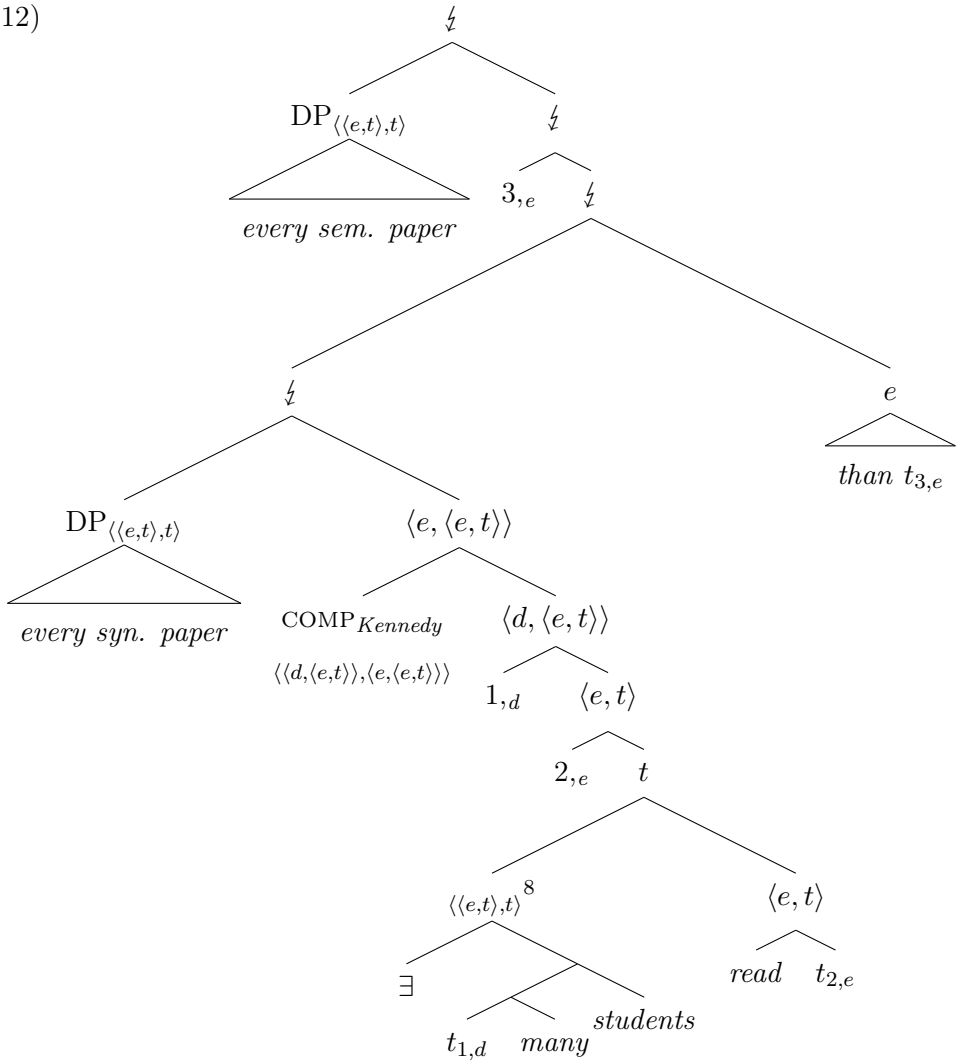
[7] Another obvious way to distinguish between COMP_{Heim} and $\text{COMP}_{\text{clausal}}$ is of course the semantic type of the first argument that the operator takes. If it can combine with clauses, then we are faced with $\text{COMP}_{\text{clausal}}$. If it can only combine with type e, we should test scope facts and internal vs. external readings to decide in favor of one or the other phrasal operator (cf. flowchart in 2.2).

'There are more people who read every syntax paper than there are people who read every semantics paper.'

b. Reading 2: [every syntax paper λx. [every semantics paper λy. [x [[COMP$_{Heim}$ than y] [λd. λz. d-many people read z]]]]]
'The least read syntax paper was read by more people than any semantics paper.'

Bhatt & Takahashi (2011a) argue that English allows reading (11-a), but not the reading in (11-b). Thus, English must have the clausal operator, while not COMP$_{Heim}$. For us, the question poses itself of whether the second, or any reading can be arrived at using COMP$_{Kennedy}$. It should not be possible with Kennedy's operator. And it is not. If we try to construct the LF, which needs parasitic movement in order to create the relation that Kennedy's operator is fed as its first argument, the derivation crashes because it is impossible to feed the operator the standard and the associate in the right order in the upper part of the tree. Consider the failed LF in (12). Note that I use the lightning sign $\lightning$ to indicate where the composition crashes.

(12)



This LF shows that Kennedy's operator cannot be used to account for Reading 2. Only Heim's operator can. I will apply this diagnostics to Nenets in 2.3.

[8] Let us for now assume that there is a covert existential quantifier that contributes the quantificational force here (I called it *indef.*$_{covert}$ before). There is a lot of work on *many* and *most* by Hackl (2001) and Nouwen (2010) who discuss the semantics of these quantifiers in detail. Thanks to Vera Hohaus (p.c.) for bringing this to my attention.

2.1.4 More on the Cross-Linguistic Inventory of Phrasal Operators

As already discussed in section 2.1.1, not all comparatives are amenable to a clausal analysis that uses the the clausal operator in (17) from Chapter 1 (cf. e.g. Hofstetter 2009, Bhatt & Takahashi 2011a, Beck, Hohaus & Tiemann 2012). Some comparatives require a Phrasal Analysis and one of the two operators, namely either Kennedy's operator in (7) or Heim's operator in (6). While both operators can deal with phrasal predicative comparatives like (4), $\text{COMP}_{Kennedy}$ derives only one of the two readings, namely the internal reading, in an attributive comparative like (2), Chapter 1, repeated below in (13).

(13) *Peter hired an older person than John.*

a. **DP-internal reading**: Peter hired an older person than John is.
b. **DP-external reading**: Peter hired an older person than John hired.

To illustrate my point, I will take the following example (from Berezovskaya & Hohaus 2015: 4).

(14) *Mary bought a faster computer than John.*

Example (14) is in principle ambiguous between a DP-external (EXT) reading, where the comparison is between Mary's and John's computer and a DP-internal (INT) reading, where Mary's computer is being compared with John. The internal reading is, of course, implausible in this case. However, it is the preferred reading for the example in (15):

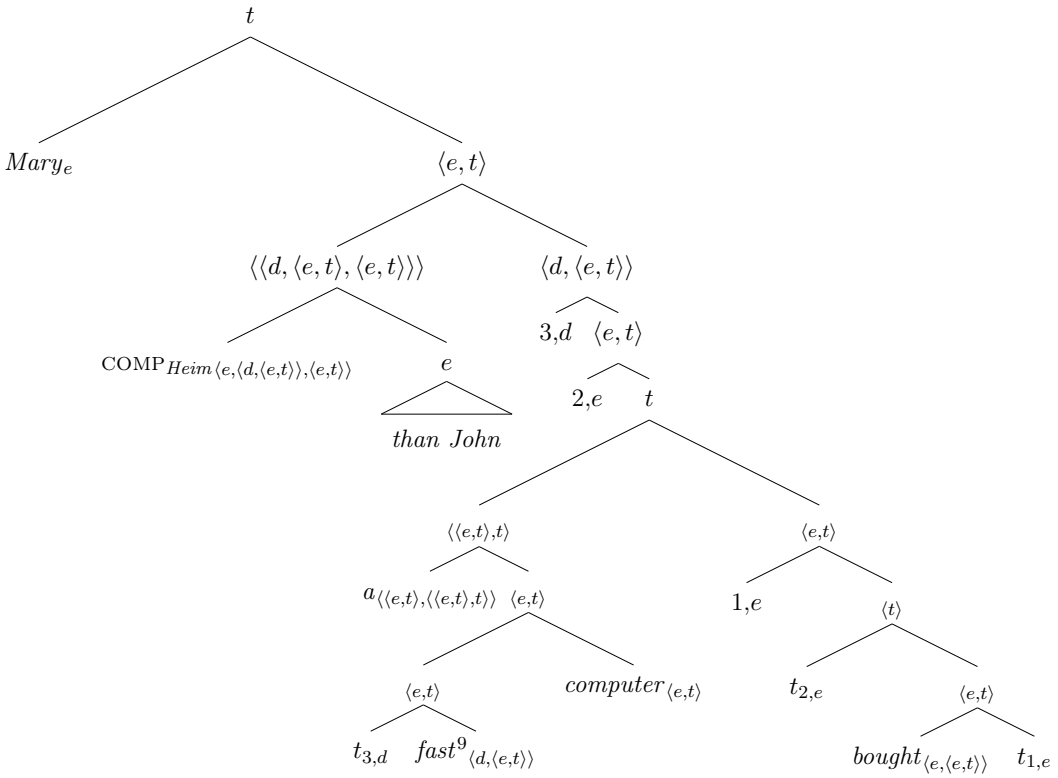
(15) *Mary bought a faster computer than her old one.*

Of the two phrasal comparatives, only COMP_{Heim} is able to generate EXT. Deriving EXT requires a degree relation of type $\langle d, \langle e, t\rangle\rangle$, namely the one in (16) and not only the lexically provided relation in the example. This relation between degrees of speed and the owner of a computer that was bought has to be syntactically derived at LF.

(16) $\lambda d.\lambda x.\exists y[computer(y)\ \&\ bought(y)(x)\ \&\ \text{SPEED}(y) \geq d]$

I illustrate the derivation of the external reading with the help of Heim's operator in the following: The LF for EXT of (14) using Heim's operator is in (17), the composition is in (18).

(17) LF using COMP_{Heim} for EXT of (14)



(18) a. $[\![[\ 1\ [t_{2,e}\ [\textit{bought}\ t_{1,e}]]]]\!] = \lambda x.\ t_{2,e}$ bought x

b. $[\![\ [_t[_{\langle\langle e,t\rangle,t\rangle}\ a\ t_{3,d}\textit{-fast computer}]\ [_{\langle e,t\rangle}\ [1\ [t_{2,e}\ [\textit{bought}\ t_{1,e}]]]]]]\!] =$
$\exists y\ [$ computer(y) & bought(y)(x) & SPEED(y) $\geq$ d$]$

[9] Here and for several other attributive cases I will ignore the fact that some adjectives are not exactly intersectional and the outcome of the semantic calculation is not what we want if we apply Predicate Modification (PM). An example: *good dancer*. By applying PM we get $[\![\textit{good dancer}]\!] = \lambda d\lambda x.x$ is d-good & x is a dancer. However, what we actually want as an outcome is: $[\![\textit{good dancer}]\!] = \lambda d\lambda x.x$ is a d-good dancer. This can be achieved by shifting the type of the adjective to a higher type, namely from $\langle d,\langle e,t\rangle\rangle$ to $\langle\langle e,t\rangle\langle d,\langle e,t\rangle\rangle$. The adjective then takes the noun (which is a predicate of type $\langle e,t\rangle$) and gives us the desired relation. Morzycki (2016) discusses such cases (cf. especially section 2.3. of the book). Since this issue does not affect any of my arguments, I will take the liberty to ignore it for now.

c. $[\![[_{\langle e,t\rangle}\ 2\ [_t[_{\langle\langle e,t\rangle,t\rangle}\ a\ t_{3,d}\text{-}fast\ computer]\ [_{\langle e,t\rangle}\ [1\ [t_{2,e}[bought\ t_{1,e}]]]]]]]\!]$
$= \lambda x.\exists y\ [\ \text{computer(y)}\ \&\ \text{bought(y)(x)}\ \&\ \textsc{speed}(\text{y}) \geq \text{d}]$

d. $[\![\ [_{\langle e,t\rangle}\ [\textsc{comp}_{Heim}\ [than\ John]]\ [_{\langle e,t\rangle}3\ [_{\langle d,\langle e,t\rangle\rangle}\ 2[_t[_{\langle\langle e,t\rangle,t\rangle}\ a\ t_{3,d}\text{-}fast\ computer]$
$[_{\langle e,t\rangle}\ [1\ [t_{2,e}[bought\ t_{1,e}]]]]]]]]\!]$
$= \lambda x.\textsc{max}(\lambda d.\exists y[\ \text{computer(y)}\ \&\ \text{bought(y)(x)}\ \&\ \textsc{speed}(\text{y}) \geq \text{d}]) >$
$\textsc{max}(\lambda d'.\exists z[\ \text{computer(z)}\ \&\ \text{bought(z)(John)}\ \&\ \textsc{speed}(\text{z}) \geq d'])$

e. $[\![\ (17)\ ]\!] = \textsc{max}(\lambda d.\exists y\ [\ \text{computer(y)}\ \&\ \text{bought(y)(Mary)}\ \&\ \textsc{speed}(\text{y}) \geq \text{d}])$
$> \textsc{max}(\lambda d'.\exists z\ [\ \text{computer(z)}\ \&\ \text{bought(z)(John)}\ \&\ \textsc{speed}(\text{z}) \geq d'])$

I want to discuss an interesting effect of interpreting the indefinite as an existential quantifier in these cases before moving forward with our actual topic[10]. Let us closely look at the term $\textsc{max}(\lambda d.\exists y\ [\ \text{computer(y)}\ \&\ \text{bought(y)(Mary)}\ \&\ \textsc{speed}(\text{y}) \geq d])$. This is the characteristic function of the set of degrees d such that there is a computer and Mary bought this computer and the computer is d-fast. The maximum of the characteristic function of the set is the speed of the fastest computer that Mary bought. In other words, we are comparing the speed of the fastest computer that Mary bought to the speed of the fastest computer that John bought. This is a reading that is straightforwardly generated from the above semantic composition. Let us call it the MAX reading. However, as a further complication, there might be yet another reading. Let us for the moment ignore our issue of phrasal vs. clausal operators and assume a standard clausal operator. The reading I am talking about is one where the indefinite is higher than the MAX-operator, i.e. where the comparison is between some computer that Mary bought (which has a certain speed) and some computer that John bought (which has another speed, lower than the computer which Mary bought). Consider the following scenario (due to Manfred Krifka):

(19) **Context:** The colleagues Mary and John both need new computers, because their old ones are broken. Mary bought one computer with 10 GHz, while John even bought two computers: one with 5 GHz and one with 20 GHz.

[10]The same complication is talked about in Hohaus & Zimmermann to appear, footnote 10.

- For most German speakers in my small informal survey, the sentence in (14) is false in the given scenario, but true for two of three English speakers I asked.

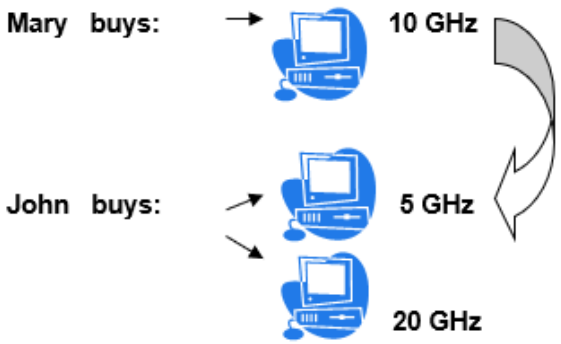


Figure 2.1: Scenario for "specific reading"

(20) SPECIFIC READING
$\exists x, y$[computer(x) & bought(x)(Mary) & computer(y) & bought(y)(John) & MAX $(\lambda d.\mu_{speed}(x) \geq d) >$ MAX$(\lambda d'.\mu_{speed}(y) \geq d')$]
Paraphrase: "There is a (specific) computer that Mary bought which is faster than a (specific) computer that John bought."

Under this reading, the indefinite is interpreted as taking wide scope with respect to MAX. However, the indefinite here is trapped under MAX. There is also another possibility to derive this reading: namely by letting the indefinite from the standard clause, i.e. the elided clause, take wide scope:

(21) $\exists y$[computer(y) & bought(y)(John) & MAX$(\lambda d.\exists x$[computer(x) & bought(x)(Mary) & $\mu_{speed}(x) \geq d$]) > MAX$(\lambda d'.\mu_{speed}(y) \geq d')$]

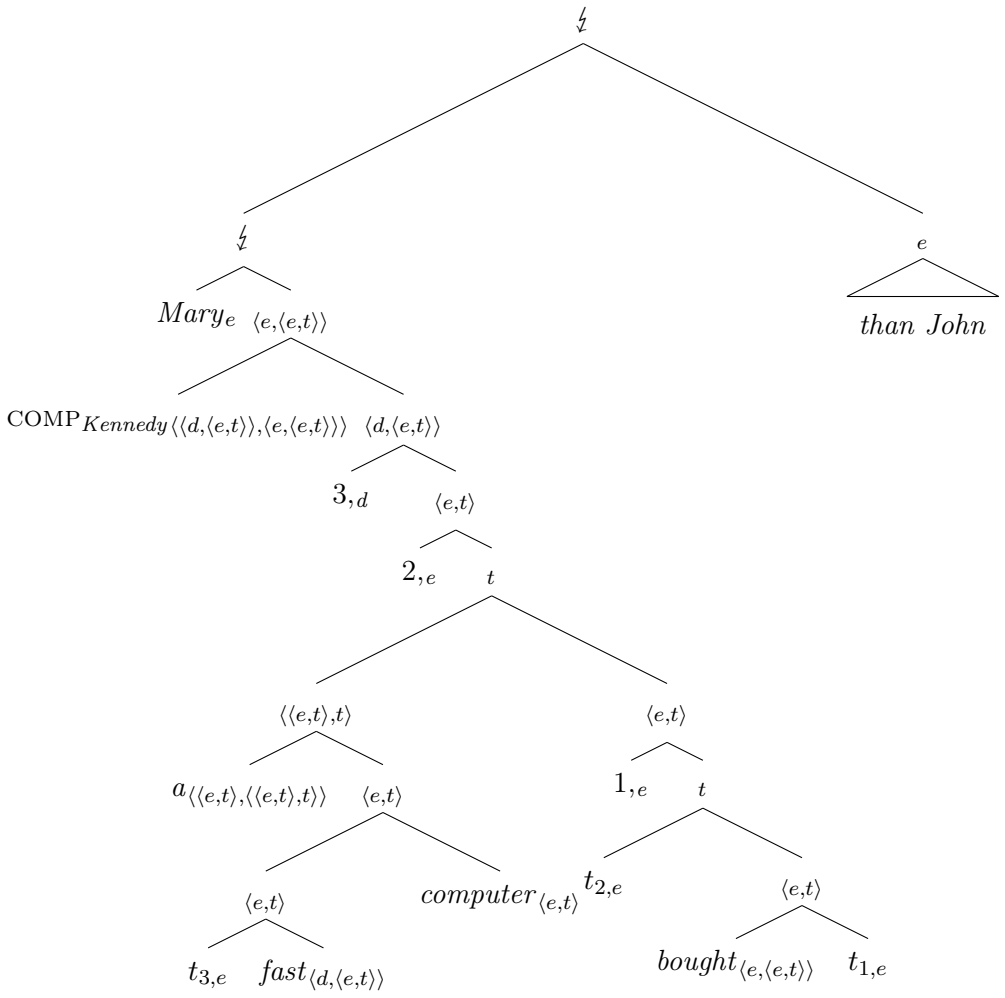
In (20) and (21), the indefinite takes wide scope out of the elided clause. Compositionally, this is not unproblematic since the process needs to target either both the matrix and the elliptical standard clause or only the elliptical clause. Technically, this reading would require existential closure over the indefinite at the sentence level. In this thesis, I always assume the quantificational analysis of indefinites. Another possibility would be a choice-functional analysis (cf. Reinhart 1997, Winter 1997, Kratzer 1998).

To sum up, this is an interesting problem that might shed light on the interaction between indefinites, focus and ellipsis! However, to my knowledge, neither the empirical picture of the (in)availability of the "specific reading" in English vs. German is clear,

nor has a solution been provided to the compositional puzzle just described. However, this complication does not impact the analysis of comparatives and therefore also the plot of this dissertation. I leave the investigation of this interesting question to further research.

Let us now try to generate an LF for EXT with Kennedy's operator.

(22) Attempted LF using $\text{COMP}_{Kennedy}$ for EXT of (14)



While we are able to derive the required syntactic degree relation in (16) by movement of the subject and parasitic movement of the degree operator (cf. e.g. Nissenbaum 2000, Beck & Sauerland 2000 for discussion), the result is a wrong one as illustrated in the

semantic composition in (23).

(23) a. $[\![[1 [t_{2,e} [\textit{bought } t_{1,e}]]]]\!] = \lambda a.\ t_{2,e}$ bought a

b. $[\![\ [t[_{\langle\langle e,t\rangle,t\rangle} \textit{ a } t_{3,d}\textit{-fast computer}] [_{\langle e,t\rangle} [1 [t_{2,e} \textit{ bought } t_{1,e}]]]]]\!] =$
$\exists b$ [computer(b) & bought(b)(c) & SPEED(b) $\geq$ d]

c. $[\![[_{\langle e,t\rangle} 2 [t[_{\langle\langle e,t\rangle,t\rangle} \textit{ a } t_{3,d}\textit{-fast computer}] [_{\langle e,t\rangle} [1 [t_{2,e}\textit{bought } t_{1,e}]]]]]]\!]$
$= \lambda z.\exists b$ [computer(b) & bought(b)(c) & SPEED(b) $\geq$ d]

d. $[\![[_{\langle d,\langle e,t\rangle\rangle} 3 [2 [t[_{\langle\langle e,t\rangle,t\rangle} \textit{ a } t_{3,d}\textit{-fast computer}] [_{\langle e,t\rangle} [1 [t_{2,e}\textit{bought } t_{1,e}]]]]]]]\!]$
$= \lambda d.\lambda z.\exists b$ [computer(b) & bought(b)(c) & SPEED(b) $\geq$ d]

e. $[\![[_{\langle e,\langle e,t\rangle\rangle}\text{COMP}_{\textit{Kennedy}} [3 [2 [a\ t_{3,e}\textit{-fast computer}] [1,_e [_t\ t_{2,e}\ \textit{bought}\ t_{1,e}\ ]]]]]]\!]$
$= \lambda y.\lambda x.\text{MAX}(\lambda d.\exists b$ [computer(b) & bought(b)(x) & SPEED(b) $\geq$ d]) $>$
$\text{MAX}(\lambda d'.\exists a[$ computer(a) & bought(a)(y) & SPEED(a) $\geq d']$)

f. $[\![[\text{Mary}[_{\langle e,\langle e,t\rangle\rangle}\text{COMP}_{\textit{Kennedy}} [3 [2 [a\ t_{3,e}\textit{-fast computer}] [1,_e [_t\ t_{2,e}\ \textit{bought}\ t_{1,e}$
$]]]]]]]\!]$
$= \lambda x.\text{MAX}(\lambda d.\exists b$ [computer(b) & bought(b)(x) & SPEED(b) $\geq$ d]) $>$
$\text{MAX}(\lambda d'.\exists a[$ computer(a) & bought(a)(**Mary**) & SPEED(a) $\geq d']$)

g. $[\![$ (22) $]\!] = 1$ iff $\text{MAX}(\lambda d.\exists b$ [computer(b) & bought(b)(**John**) & SPEED(b)
$\geq$ d]) $>$ $\text{MAX}(\lambda d'.\exists a[$ computer(a) & bought(a)(**Mary**) & SPEED(a) $\geq d']$)

As the calculation in (23) shows, the Kennedy operator cannot combine with its two e-type arguments in the intended order. As a result, the standard and the associate are reversed yielding the wrong truth conditions. Is there a way to salvage the situation via syntax? Well, in Kennedy's syntax, the AP is a complement of the Deg-head and is not in the specifier of the DegP, as is the case in Heim's syntax. For the external reading to work, the verb has to be part of the relation under the Kennedy operator, i.e. the first argument of $\text{COMP}_{\textit{Kennedy}}$ (which is the gradable relation) has to contain the verb. This is problematic, since we have a head movement of the operator which crosses several maximal projections going against the head movement constraint. This problem is not present with the Heim-operator where the DegP is in Spec,AP and moves. Even if we adjoin the *than*-phrase as a sister to an intermediate Deg'-projection instead of adjoining it as in (22), the same problem arises. Another obvious solution to this problem would be to use a different operator, namely Merchant's phrasal operator in (8) where the associate and the standard would be fed the operator in such an order that we would get the right truth conditions. However, for Kennedy's operator, there is no other possible solution.

With Berezovskaya & Hohaus (2015), I interpret this in the following way: Kennedy's

operator cannot undergo parasitic movement and must be interpreted *in situ*. When it is interpreted *in situ*, we only derive INT. While Beck, Hohaus & Tiemann (2012) conclude that this particular phrasal operator is scopally not mobile, I argue that this generalization is not quite right and that the operator has a limited syntactic mobility after all.

We have just seen that Kennedy's operator cannot deal with external readings of attributive comparatives. The following question thus imposes itself: Is there indeed evidence that we need that many operators, in particular both phrasal operators? These questions are particularly pressing for $\text{COMP}_{Kennedy}$, an operator which lacks the empirical coverage of COMP_{Heim}, and which we therefore might be tempted to remove from our inventory of degree operators. Data from first language acquisition (Hohaus, Tiemann & Beck 2014, Tiemann, Hohaus & Beck 2012) as well as cross-linguistic research (Merchant 2009, Merchant 2011, Merchant 2012; Beck, Hohaus & Tiemann 2012) suggest that such a move would be too hasty: First, in L1-acquisition, English *than*-constituents are acquired significantly earlier than their German equivalents suggesting that they receive a simpler analysis in English than they do in German, namely an analysis with $\text{COMP}_{Kennedy}$. Second, Greek has two different phrasal comparative constructions which differ in the way the standard is realized, examples of which are provided in (24-a) and (24-b).

(24) a. *O Giannis exi perisotera periodika* [*apo mena*].
the Giannis has more magazines from me
'Giannis has more magazines than I have.'

b. #*O Giannis exi perisotera periodika* [*mu*].
the Giannis has more magazines me(GEN.)
#'Giannis has more magazines than I am.' (Merchant 2012 : 6)

Our interpretation of the unacceptability of (24-b) is this: the genitive-marked comparative in Greek only allows for INT but lacks EXT. An analysis that applies $\text{COMP}_{Kennedy}$ thus suggests itself.

Then again, if we take a closer look at the cross-linguistic picture in the following Table 2.2, Greek and English are the only languages for which such an analysis can be proposed at this point.

English	$\text{COMP}_{\text{clausal}}$ $\text{COMP}_{Kennedy}$
German	$\text{COMP}_{\text{clausal}}$
Hindi (Bhatt & Takahashi 2011a)	COMP_{Heim}
Persian, Tajiki, Ishkashimi (Karvovskaya 2013)	COMP_{Heim}
Turkish, Thai (Hofstetter 2009, Hofstetter 2012)	COMP_{Heim}
Greek (Merchant 2009, Merchant 2012)	$\text{COMP}_{\text{clausal}}$ (*ap'oti*-clause) COMP_{Heim} (*apo*-phrase) $\text{COMP}_{Kennedy}$ (genitive-marked standard)

Table 2.2: The Inventory of Comparative Operators in Several Selected Languages

If we want to hold on to $\text{COMP}_{Kennedy}$, it would make the argument for this operator stronger if we found another language that needs this operator. We argue in Berezovskaya & Hohaus (2015) that Russian is such a language. Again, the overarching question is: Why should we keep $\text{COMP}_{Kennedy}$ in our inventory of degree operators when it only has limited applicability in that it can account only for a proper subset of constructions when compared to those that Heim's operator can account for? Do we see evidence for both phrasal operators described in the literature (COMP_{Heim} and $\text{COMP}_{Kennedy}$) or do we only need the stronger one (COMP_{Heim}) that covers a wider range of constructions? COMP_{Heim} allows for two things that $\text{COMP}_{Kennedy}$ does not: It allows for DP-external readings and scope ambiguities. This provides us with two tools to test which operator is used. In section 2.2.2, I will use these diagnostics to show that Russian is a language that suggests that we need $\text{COMP}_{Kennedy}$ in the inventory of the phrasal operators.

2.2 Comparative Operator(s) in Russian

Crucial parts of the data and analysis for this section can be found in Berezovskaya & Hohaus (2015). For more details on Russian comparison constructions, cf. Berezovskaya (2014) where I conducted an acquisition study by Russian-speaking children.

I will first introduce two ways of marking the standard of comparison in Russian in section 2.2.1 and then analyze genitive-marked comparatives in 2.2.2.

2.2.1 Two Ways of Marking the Standard of Comparison in Russian

Concerning the composition in the *than*-clause, the standard of comparison can be expressed in two ways: either by the *wh*-word *čem* (a *wh*-word in the instrumental case) followed by a clause, cf. (25-a) or by a DP in the genitive case, cf. (25-b).

(25) a. *Zoya sil'n-ee čem Petya.*
Zoya strong-COMP. what(INSTR.) Petya

b. *Zoya sil'n-ee Pet-i.*
Zoya strong-COMP. Petya-GEN.
'Zoya is stronger than Petya.'

Pancheva (2006) treats comparative standards of the kind in (25-a) as instances of a reduced clause because of the possibility of having an overt tensed verb, and because the *wh*-word causes *wh*-movement. Further evidence for a clausal analysis comes from examples such as (26) which contain a tensed auxiliary (cf. Berezovskaya & Hohaus 2015).

(26) *Oleg umn-ee [čem byl Tolya v ego vozraste].*
Oleg clever–COMP. what(INSTR.) was Tolya in his age
'Oleg is cleverer than Tolya was when he was his age.'

Russian comparatives involving *čem*-clauses can thus be analyzed similarly to English clausal comparatives that use the clausal operator $\text{COMP}_{\text{clausal}}$ in (17), Chapter 1. The only difference is the overt *wh*-movement that is covert in English and uses a different *wh*-word, namely *čem*. As a result, I assign the following LF to (25-a):

(27) $[[_{\text{DegP}}\ \text{COMP}_{\text{CLAUSAL}\langle\langle d,t\rangle,\langle\langle d,t\rangle,t\rangle\rangle}$ [*čem*$_1$ *Petya* $t_{1,d}$*-sil'nyj*]] [2 [*Zoya* [$t_{2,d}$*-sil'naya*]]]]

Note that this LF has no overt preposition corresponding to *than* in English.
A further argument in favor of Russian comparatives with *čem*-clauses needing a clausal analysis are constraints on movement as discussed in Hankamer (1973). Namely, if we leave the *wh*-word *in situ*, the question is grammatical resulting in an echo question in Russian, cf. (28-b). However, if we *wh*-move the question word occupying the position of the comparative standard, we get a clear ungrammaticality in (28-c):

(28) a. *Vanya vyš-e* *čem* *Borya.*
Vanya tall-COMP. what(INSTR.) Borya.
'Vanya is taller than Borya.'

b. *Vanya vyš-e* *čem* *kto?*
Vanya tall-COMP. what(INSTR.) who(NOM.)
'Vanya is taller than who?'

c. **Kto* *Vanya vyš-e* *čem?*
who(NOM.) Vanya tall-COMP. what(INSTR.)

This is different in the case of a genitive-marked construction like (25-b). Here are several arguments for why genitive-marked comparatives cannot receive a clausal analysis:
(i) According to data from Hankamer (1973), if the standard of comparison is underlyingly the subject of a transitive, the genitive-marked version is bad:

(29) a. *Vanya s"el bol'she jaiz* *čem* *Petya.*
Vanya ate more eggs what(INSTR.) Petya

b. **Vanya s"el bol'she jaiz* *Pet-i.*
Vanya ate more eggs Petya-GEN.
'Vanya ate more eggs than Petya.'

(ii) Also, coming back to the evidence from (28), the genitive-marked comparatives do not seem to be subject to the same contraints on movement:

(30) a. *Vanya vyš-e* *Bor-i.*
Vanya tall-COMP. Borya-GEN.
'Vanya is taller than Borya.'

b. *Vanya vyš-e* *kogo?*
Vanya tall-COMP. who(GEN.)
'Vanya is taller than who?'

c. *Kogo* *Vanya vyš-e?*
who(GEN.) Vanya tall-COMP.
'Who is Vanya taller than?'

According to my own introspection, example (30-c) is grammatical, although the object *wh*-word has been moved to the front.

Summarizing, we have seen that Russian comparatives with *čem* require the clausal operator, while Russian genitive-marked comparatives require a phrasal operator. The next subsection will show that this operator is $\text{COMP}_{Kennedy}$.

2.2.2 Evidence for Kennedy's Operator from Russian

Approaching the quintessence of the analysis of Russian comparatives, I will show in this subsection that Russian genitive-marked comparatives are best analyzed as employing $\text{COMP}_{Kennedy}$, because (i) they do not allow for clausal standards, (ii) they do not allow for DP-external readings when used attributively, and (iii) they do not exhibit scope ambiguities. Let us now look at the relevant data that provides evidence for (i), (ii) and (iii).

(i) Unavailability of Clausal Standards. The first piece of data that suggests that genitive-marked comparatives are best analyzed with $\text{COMP}_{Kennedy}$ is that they, quite expectedly, do not allow for clausal standards. Consider the minimal pair in (31-a) and (31-b):

(31) a. *Masha pela grom-če* [*čem* *Katya svistela*].
Masha sang loud-COMP what(INSTR) Katya whistled

b. **Masha pela grom-če* [*Kat-i* *svistela*].
Masha sang loud-COMP Katya-GEN whistled
'Masha sang louder than Katya whistled.'

While the *čem*-clause works fine when we add another predicate ('whistle') in the standard of comparison, the genitive-marked standard in (31-b) does not tolerate the insertion of the other predicate. The example in (31-b) is clearly only compatible with a Phrasal Analysis. However, this piece of evidence is not enough to show that genitive-marked comparatives in Russian use $\text{COMP}_{Kennedy}$, since this is still compatible with both Heim's and Kennedy's operator. Now, the next piece of evidence is only compatible with Russian genitive-marked comparatives using Kennedy's operator.

(ii) Unavailability of DP-external Readings of Attributive Uses. When used attributively, Russian genitive-marked comparatives lack EXT and only allow for the *in situ* interpretation, INT. Consider the examples in (32-a) and (32-b). In (32-a), the internal reading is the preferred one, as computers do not own computers. In (32-b), the comparison is between Masha's and Vanya's computer. However, this interpretation is not available and only the implausible, internal reading is possible (indicated by the hash).

(32) a. *Masha kupila* [*kompjuter* [$_{\text{AP}}$ *moščn-ee* *èto-go* *kompjuter-a*]].
Masha bought computer(ACC) powerful-COMP this-GEN computer-GEN
'Masha bought a more powerful computer than this computer.'

b. #*Masha kupila* [*kompjuter* [$_{\text{AP}}$ *moščn-ee* Vani]].
Masha bought computer(ACC) powerful-COMP Vanya-GEN
'Masha bought a computer more powerful than Vanya.'

Under an analysis where Russian genitive-marked comparatives employ $\text{COMP}_{Kennedy}$, this pattern is expected as the operator cannot undergo the parasitic movement needed to derive the external reading (cf. (22)).

Before we move on, let us briefly consider the syntactic status of the phrases that we label as Adjective Phrases (APs) in (32-a) and (32-b). Considering that attributive APs in Russian occur both post-as well as pre-nominally, as in the contextual comparatives (ConC) in (33) (contextual because the standard of the comparison is not provided explicitly, but can be provided by the context), it could be objected that in both examples above these APs are contained within a reduced relative clause with the structure in (34). This is the syntactic analysis that Matushansky (2002) assumes for analogous examples.

(33) a. *Masha kupila* [[$_{\text{AP}}$ *bolee moščnyj*] *kompjuter*].
Masha bought more powerful computer(ACC.)
'Masha bought a more powerful computer.' (compared to a contextually salient other computer)

b. *Masha kupila* [[*kompjuter*] [$_{\text{AP}}$ *bolee moščnyj*]].
Masha bought computer(ACC.) more powerful
'Masha bought a more powerful computer.' (compared to a contextually salient other computer)[11]

(34) [$_{\text{NP}}$ $\langle e,t\rangle$ [$_{\text{N'}}$ computer$_{\langle e,t\rangle}$ [**RelCl**$_{\langle e,t\rangle}$ $\varnothing$ 1,$_e$ [t$_1$,$_e$ more.powerful [...]]]]]

If (34) is indeed the underlying structure for this type of example, the unavalibility of EXT might be simply an island effect: The derivation of the relevant reading requires movement of the degree operator out of the relative clause. Such movements might

[11] The attentive reader might have noticed that we employ the analytic form of the comparative, namely *bolee moščnyj* ('more powerful') in this example. The synthetic for *moščnee* is out here. We are aware of the fact that there are certain restrictions on the distribution of the synthetic vs. analytic comparative forms (cf. e.g. Matushansky 2002). However, I think that the synthetic/analytic-distinction is not relevant to our question. What is important here is the the AP can occupy both the pre-nominal and the post-nominal position in Russian.

be blocked if relative clauses, even in their reduced form, constitute syntactic islands in Russian (and are thus not a reflex of the choice of the degree operator). Until this syntactic question has received the closer attention that it deserves, I am unable to decide whether a reduced-relative-clause analysis is any more plausible (or any less stipulative) than the AP-analysis we assume above. Two pieces of data might however point in the direction of our AP-analysis. I discuss them now in turn.

First, the genitive-marked comparative is to a certain degree acceptable even in the pre-nominal position, as is illustrated in the example in (35-a) and (35-b), both of which are certainly not entirely sound in Russian:

(35) a. ??*Masha kupila* [$_{\text{NP}}$[$_{\text{AP}}$*moščn-ee kompjuter*] *Van-i*].
Masha bought powerful-COMP. computer(ACC.) Vanya-GEN.

b. ?*Masha kupila* [$_{\text{NP}}$[$_{\text{AP}}$*moščn-ee Van-i* *kompjuter*]].
Masha bought powerful-COMP. Vanya-GEN. computer(ACC.)
'Masha bought a more powerful computer than Vanya.'

For both examples, the plausible reading EXT is, however, unavailable (the question marks only indicate the decreased well-formedness, not the interpretation which would get a hash). Besides, temporal adverbial phrases, which would constitute evidence for more structure beyond AP, are ungrammatical in the post-nominal genitive-marked comparative in Russian, cf. (36-a). They are, on the other hand, grammatical in the corresponding relative-clause construction, as illustrated in (36-b).

(36) a. **Masha včera kupila cvetok* [*segodnja eščjo*] *krasiv-ee.*
Masha yesterday bought flower today even pretty-COMP
'Yesterday, Masha bought a flower even more beautiful today.'

b. *Masha včera kupila cvetok* [*kotoryj segodnja eščjo*] *krasiv-ee.*
Masha yesterday bought flower which today even pretty-COMP
'Yesterday, Masha bought a flower which today is even more beautiful.'

I leave further exploration of this important question to future research, and move on to the last piece of evidence in favor of an analysis that employs Kennedy's operator for genitive-marked comparatives in Russian.

(iii) Unavailability of Scope Ambiguities. As expected under such an analysis, genitive-marked comparatives in Russian do not exhibit scope ambiguities. In this respect they

are unlike their clausal siblings, the *čem*-clauses for which Krasikova (2007) and Beck et al. (2009) observe ambiguities between the Degree Phrase (DegP), which hosts the comparative operator, and other quantificational elements such as modals.

Consider the phrasal comparative in (37-a), for example, which only has the surface scope reading. The inverse scope reading, under which the comparison is between what both girls desire (and which requires movement of the comparative operator above the propositional attitude verb), is absent. Both readings are, however, available for the clausal comparative in (37-b). The truth conditions for the available reading in (37-a) are in (38-a) and for the high-DegP reading (inverse scope reading) that is only available with the *čem*-clause are in (38-b).

(37) a. *Katya xočet byt' vy-še Mash-i.*
Katya wants be tall-COMP. Masha-GEN.
'Katya wants to be taller than Masha is tall. ' [want > COMP]
≠ 'Katya wants to be taller than Masha wants to be tall.'[COMP > want]

b. *Katya xočet byt' vyš-e čem Masha.*
Katya wants be tall-COMP. what(INSTR.) Masha
= 'Katya wants to be taller than Masha is tall.' [want > COMP]
= 'Katya wants to be taller than Masha wants to be tall.'[COMP > want]

(38) a. MAX($\lambda d.\forall w' \in$ BOUL(w@): Katya is d-tall in w') [want > COMP]
> MAX($\lambda d'$.Masha is d'-tall in w@)[12]

b. MAX($\lambda d.\forall w' \in$ BOUL(w@): Katya is d-tall in w') [COMP > want]
> MAX($\lambda d'.\forall w' \in$ BOUL(w@): Masha is d'-tall in w')

The reading in which the intensional verb scopes over the comparative becomes visible in contexts like (39).

(39) Katya is 1.65m tall and Masha is 1.75m tall, so the actual height of Masha exceeds the actual height of Katya. Katya's desire is to be taller than Masha is tall in the actual world.

The following context forces the reading where the comparative scopes over the intensional verb (only possible with the *čem*-clause):

[12] BOUL stands for bouletic worlds.

(40) Imagine that Katya's height of her dreams is 1.80m and Masha's height of her dreams is 1.70m. In reality, Katya is 1.60m tall and Masha 1.65m.

In this situation, it is true that Katya wants to be taller than Masha, although, in the actual world, they are both smaller than the desired height and actually Masha is taller than Katya.

Some explanations are in order here to clarify the status of these ambiguities modulo concerns voiced in Heim (2001). We need to distinguish (i) ellipsis, (ii) the relation R for the phrasal comparative operator and (iii) interaction with other scope-bearing elements.

Concerning point (i), the ellipsis facts: Now, one might object that the example in (37) does not show what it claims to show: namely that in the genitive-marked case, there is no scope ambiguity, while in the clausal (*čem*-case) there is. The reason for this objection from Heim (2001) is that the examples are reminiscent of the following (the example is in a., the two possible readings are in b. and c.):

(41) a. *John needs to drive faster than Mary does.*
b. *John needs to drive faster than Mary does ~~drive d-fast~~.*
c. *John needs to drive faster than Mary does ~~need to drive d-fast~~.*

(Heim 2001: 232)

Here we see an ambiguity in antecedent choice. If we were faced with a clausal comparative that needs ellipsis, this would constitute a problem for our examples! However, we are looking at a phrasal standard where there is no option of such an ellipsis, but where instead there is only "semantic ellipsis" introduced by Heim (2001: 229 ff.) By this she means constructions is which there aren't two parallel pieces of LF-structure which stand in an anaphor-antecedent relation. There is just a single piece which is, however, used twice in the semantic calculation. An example from Heim is the adverbial superlative in (42-a). The LF is in (42-b) and the lexical entry for the superlative operator proposed by Heim for this example are in (42-c).

(42) a. *John screamed (the) loudest.* (Heim 2001: 234)
b. LF: John –est$_1$ [[scream t$_1$ loud]]
c. $[\![\text{-}est]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.\text{MAX}\{d : R(x,d)\} > \text{MAX}\{d : \exists y \neq x : R(y,d)\}$

This brings us to our point (ii), the relation R in the phrasal comparative operator: Example (42-a) can be paraphrased by: 'John screamed louder than anyone else did.' R, the denotation of *-est's* complement is "used twice" in the semantic composition when we look at the lexical entry in (42-c). The same is true in our case for the Russian genitive-marked comparatives that are clearly phrasal and are analyzed as using a phrasal operator in the semantics. Looking at the lexical entries of the phrasal operators in (6) and (7), it becomes clear that there is only one degree relation, R, (type $\langle d, \langle e, t \rangle \rangle$) which is, however, used twice in the calculation.

Let us now discuss point (iii), the interaction with other scope-bearing elements: First, DegP doesn't scope over negation and other monotone decreasing items (like negation), according to Heim (2001). Scoping over upward monotone operators always gives equivalent readings, and scoping over downward monotone ones always implies presupposition failure (cf. also work by Anna Szabolcsi and Frans Zwarts in Szabolcsi & Zwarts 1990, Szabolcsi & Zwarts 1993 on scope and downward entailing quantifiers). That means that non-monotone operators (for instance *exactly*-differentials) are all we have for testing the ambiguity. Heim (2001) concludes (with Stateva 2000) that DegPs are able to scope over some intensional verbs. An example for such a genuine ambiguity with an *exactly*-differential was given in (30) in Chapter 1 and is repeated here for your convenience:

(43) (**Context**: The draft is 10 pages). *The paper is required to be exactly 5 pages longer than that.* (Heim 2001: 224, ex. (28))

I want to point out here that the ambiguities that I employ above to show that genitive-marked comparatives do not produce the same ambiguities as their clausal siblings are not the same as (43) and not the same as tested in Krasikova (2007) and Beck et al. (2009). A pleasant side effect is also that the ambiguities like (37) are much more realistic for elicitation in a fieldwork setting than the ambiguities from the B17-paper (that go back to Heim 2001), since we avoid problems with the minimal requirement reading, that is even hard to grasp in languages where they have been well studied, like, for instance, English[13].

Since scope ambiguities are not necessarily truth-conditional ambiguities (cf. a case with two universal quantifiers like *Every teacher praised every student.*), Heim (2001: 217)

[13]One problem in my fieldwork setting where the lingua franca is Russian is that Russian modals work differently than English ones, cf. e.g. Krasikova (2010).

says: "If we want to study the properties of QR, we must choose our examples judiciously. [...] When it comes to quantifiers over degrees rather than ordinary individuals, this point is especially pertinent." In other words, scope ambiguities are not *per se* diagnostics for a mobile comparative operator. In our case however, we are looking at a phrasal (genitive-marked) comparison. We are seeing a genuine potential ambiguity in (37-a), which is, however, not borne out, because $\text{COMP}_{Kennedy}$ cannot raise across the intensional predicate. The example in (37) uses the verb 'want' which is possibly a neg-raising verb in Russian (as it is in English). Since this might in addition complicate the scope facts, let us look at another example (my introspection), namely the Russian translation of the English example in (41) with a genitive-marked standard:

(44) *Van-e nado exat' bystr-ee Son-i.*
Vanya-DAT. has.to drive fast-COMP. Sonya-GEN.
= 'Vanya must drive faster than Sonya drives.' [must > COMP]
≠ 'Vanya must drive faster than Sonya must drive. ' [COMP > must]

For clarification, here is a context that makes the first reading (must > COMP]) true and the second false:

(45) Vanya is driving 50 km/h. Sonya is driving 60 km/h. Vanya wants to overtake Sonya. In order to do this, ...

The example in (44) is parallel to Heim's (41), however in this case the ambiguity cannot be due to antecedent choice, but must be due to scope, because the standard is phrasal. In my introspective intuition, again, this example does not have the high-DegP reading. The clausal pendant with *čem*, on the other hand, also has the high DegP reading, where we compare both persons' need to drive faster.

Interim Summary. I hope to have convinced the reader that analyzing Russian genitive-marked comparatives as using $\text{COMP}_{Kennedy}$ is the best option because of the (i) unavailability of clausal standards, (ii) the unavailability of DP-external readings in attributive comparatives and (iii) unavailability of scope ambiguities. I will now briefly discuss further repercussions of this analysis by considering the case of adverbial comparatives in Russian.

2.2.2.1 Genitive-marked Adverbial Comparatives in Russian

A comparison between genitive-marked standards of comparatives in Russian and Greek turns out to be worthwhile as it brings to light an interesting distinction between the two languages: Only in Russian are adverbial genitive-marked comparatives grammatical.

When we turn back to the cross-linguistic picture, Russian is like English and Greek in that it has $\text{COMP}_{(Kennedy)}$ at its disposal. Russian and Greek are, however, morphologically more transparent than English in that they indicate which operator a comparative employs by introducing the standard of comparison differently depending on the operator. The whole pattern in summarized in Table 2.3 below.

Russian	$\text{COMP}_{\text{clausal}}$ (*čem*-clause) $\text{COMP}_{Kennedy}$ (genitive-marked standard)
Greek (Merchant 2009, Merchant 2012)	$\text{COMP}_{\text{clausal}}$ (*ap'oti*-clause) COMP_{Heim} (*apo*-phrase) $\text{COMP}_{Kennedy}$ (genitive-marked standard)

Table 2.3: Comparison of the Inventory of Operators in Russian and Greek

The two languages differ, when it comes to adverbial comparatives in which the standard is marked by genitive case. Consider the minimal pair in (46) and (47). While the adverbial comparative is ungrammatical in Greek, it is perfectly natural in Russian. Another example from Russian is (48).

(46) *I Maria pezi kithara kalitera* {*apo mena*/**mu*}.
the Maria plays guitar better {from me/me(GEN.)}
'Maria plays the guitar better than me.'(Merchant 2012: 6) Greek

(47) *Masha igraet na gitar-e lučše menja.*
Masha plays on guitar-PREP. better me(GEN.)
'Masha plays the guitar better than me.' Russian

(48) *Masha bežala bystr-ee Van-i.*
Masha ran fast-COMP Vanya-GEN.
'Masha ran faster than Vanya.' Russian

Since I claim that genitive comparatives in Russian are phrasal, adverbial genitive-marked

comparatives seem to represent a challenge for this plot. Berezovskaya & Hohaus (2015) provide a possible solution to this question in terms of a type-shifting analysis which I present here. Adverbial comparatives require a slightly different analysis than the predicative and attributive cases discussed above, an analysis which takes into account the fact that what is compared in (47) and (48) are events (music sessions, running). Their Phrasal Analysis thus requires a somewhat different operator. Here's how Berezovskaya & Hohaus (2015) proceed: They first propose a suitable operator for phrasal adverbial comparatives which is derived from but not identical to $\text{COMP}_{Kennedy}$, then put it to work.

Considering the comparison in (48), the relation underlying it is the one in (49) rather than the relation lexically provided by the adverbial, in (50). The standard of the comparison, Vanya, is mapped by (49) into his running event, whose speed is then measured.

(49) $\lambda d_d.\lambda z_e.\ \lambda e_v.\text{run(e)(z)}\ \&\ \text{SPEED}(e) \geq d$

(50) $\lambda d_d.\lambda e_v.\text{SPEED}(e) \geq d$

In (52), a phrasal, adverbial operator ($\text{COMP}_{Kennedy\text{-}adverbial}$) is suggested (cf. Kennedy's original operator in (7) repeated in (51)) which requires a relation such as (49) for its first argument. The operator is parallel to $\text{COMP}_{Kennedy}$ as far as its argument structure is concerned, merely enriched with events. The type of semantic ellipsis in the phrasal comparatives requires that the adverbial operator introduce and existentially close the event associated with the genitive-marked standard. In the case of (48), this is the running event associated with Vanya. It would also be conceivable that the operator presupposes the existence of such an event rather than asserts it. But I will go for the other option here.

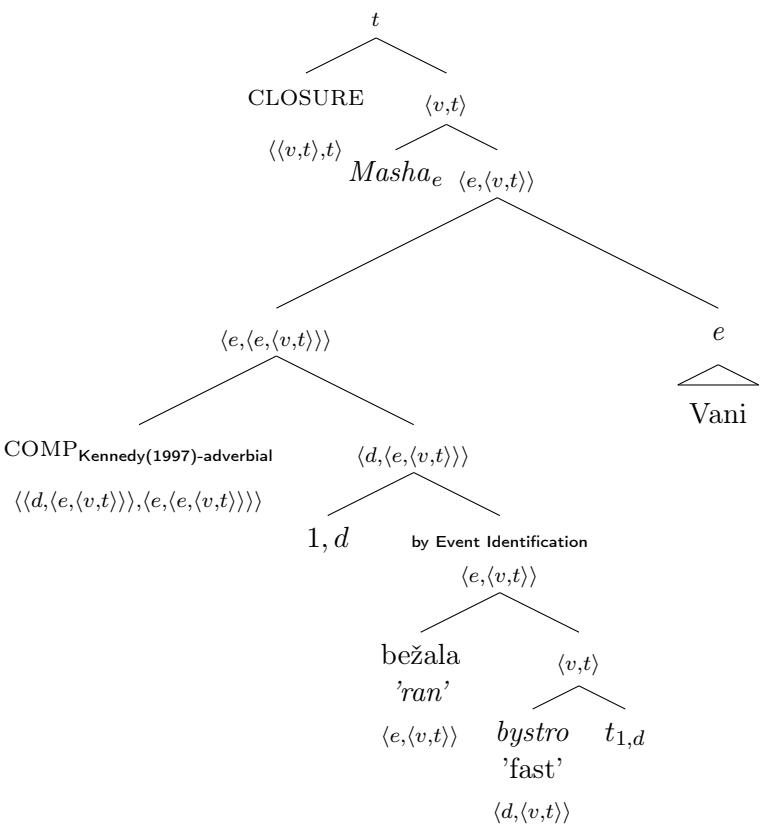
(51) $[\![\,\text{COMP}_{(Kennedy)}\,]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}.\,\lambda y_e.\,\lambda x_e.\,\text{MAX}(\lambda d.\,R(d)(x)) > \text{MAX}(\lambda d'.\,R(d')(y))$

(52) $[\![\,\text{COMP}_{(Kennedy\text{-}adverbial)}\,]\!] = \lambda R_{\langle d,\langle e,\langle v,t\rangle\rangle\rangle}.\,\lambda y_e.\,\lambda x_e.\,\lambda \mathbf{e_v}.\,\exists e'[\text{MAX}(\lambda d.\,R(d)(x)(e)) > \text{MAX}(\lambda d'.\,R(d')(y)(e)')]$[14]

[14]Sigrid Beck, p.c., brought the following to my attention: Potentially, there is an issue with MAX scoping below the existential $\exists e$: the generated reading might be too weak. In our example it would

Let us now apply (52) to our example in (48), which has the LF in (53).

(53)



(54) $[\![\text{CLOSURE}]\!] = \lambda P_{\langle v,\, t\rangle}.\exists e[P(e)]$

(55) $\exists e, e'[\text{MAX}(\lambda d.run(e)(Mary)\&\text{SPEED}(e) \geq d) >$
$\text{MAX}(\lambda d'.run(e')(John)\&\text{SPEED}(e') \geq d')]$
'There are two events e and e' such that the maximal speed of Mary's running event e exceeds the maximal speed of John's running event e''

A couple of remarks might be helpful, from bottom to top. As indicated in (50), we assume gradable adverbials to be of type $\langle d, \langle v, t\rangle\rangle$. The verb combines with the adverbial phrase via Event Identification (EI) (Kratzer 2002, an operation that will be compared to RESTRICT by Chung & Ladusaw and to my new Degree Restrict). Type mismatch

be verified by a slow step of Vanja. A way out might be to make the event arguments free and not quantify them off by the existential. In that case, we would need two salient events in the context. A careful investigation would be required here paired with solid understanding of adverbial modification and event semantics. This can clearly not be accomplished in the scope of this dissertation.

forces the degree operator to move from its base position. It is this movement which creates the relation in (49). Note that while adverbial comparatives thus require movement at LF, the movement in is not parasitic, as it would have to be in the external attributive case. I neglect the contribution of aspect and tense here and merely assume the operation CLOSURE, in (54), which existentially quantifies off the event argument (Heim 1982). The resulting truth conditions are in (55) above.

This solution provided by Berezovskaya & Hohaus (2015) is a type-shift from a basic $\langle d, \langle d, t\rangle\rangle$ comparison via the available phrasal comparative operators. This accounts for the data in Russian genitive-marked comparatives, such as (47) and (48). But what does it tell us about the grammar of comparison? I want to argue with Berezovskaya & Hohaus (2015) that the contrast we observe between Greek and Russian can be explained as a case of lexical variation: Russian decided to add this phrasal adverbial operator to its lexical inventory, while Greek did not. It would be good to work out this comparative case on the basis of a solid understanding of adverbial modification and to try to understand harder what this possibility of yet another type shift tells us about the grammar of comparison. However, this seems clearly out of the scope of this dissertation and must be left for future research.

Let us now update Table 2.3 from above adding the operator in (52).

Russian	$\text{COMP}_{\text{clausal}}$ (*čem*-clause) $\text{COMP}_{Kennedy}$ (genitive-marked standard) $\textbf{COMP}_{\textbf{\textit{Kennedy}-adverbial}}$ (genitive-marked standard)
Greek (Merchant 2009, Merchant 2012)	$\text{COMP}_{\text{clausal}}$ (*ap'oti*-clause) COMP_{Heim} (*apo*-phrase) $\text{COMP}_{Kennedy}$ (genitive-marked standard)

Table 2.4: Revised Inventory of Operators in Russian and Greek

2.2.3 Back to the Cross-Linguistic Picture

I suggest that the variation we observe between Russian and Greek is a case of variation in the functional lexicon. The two languages differ in the inventory of phrasal operators which they have at their disposal, as we see in Table 2.4. It thus appears that languages might choose whether or not to extend $\text{COMP}_{Kennedy}$ to the domain of eventualities.

I now add Russian to the cross-linguistic landscape of comparison in Table 2.2.

English	$\text{COMP}_{\text{clausal}}$ $\text{COMP}_{Kennedy}$
German	$\text{COMP}_{\text{clausal}}$
Hindi (Bhatt & Takahashi 2011a)	COMP_{Heim}
Persian, Tajiki, Ishkashimi (Karvovskaya 2013)	COMP_{Heim}
Turkish, Thai (Hofstetter 2009, Hofstetter 2012)	COMP_{Heim}
Greek (Merchant 2009, Merchant 2012)	$\text{COMP}_{\text{clausal}}$ (*ap'oti*-clause) COMP_{Heim} (*apo*-phrase) $\text{COMP}_{Kennedy}$ (genitive-marked standard)
Russian	$\text{COMP}_{\text{clausal}}$ (*čem*-clause) $\text{COMP}_{Kennedy}$ (genitive-marked standard) **$\text{COMP}_{Kennedy\text{-adverbial}}$** (genitive-marked standard)

Table 2.5: Revised Inventory of Comparative Operators in Several Selected Languages

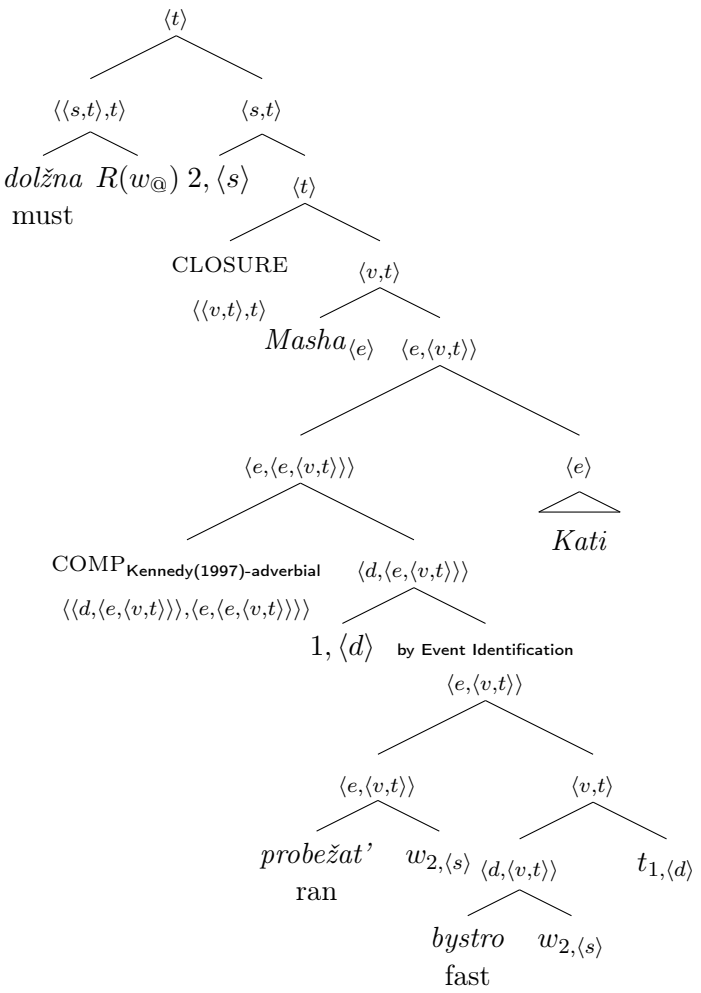
Before concluding, I want to comment on the movement observed in the LF in (53). What we see is that Kennedy-style schönfinkeled operators are not generally banned from moving. In order for the analysis of Russian genitive-marked adverbial comparatives to work, these phrasal operators thus have to move, i.e. they do have some mobility contra Beck, Hohaus & Tiemann (2012). The VP-internal movement $\text{COMP}_{Kennedy\text{-adverbial}}$ undergoes in (53) is not banned. Any parasitic movement, as we have shown for the Russian attributive comparatives with $\text{COMP}_{Kennedy}$ in (22), is however not possible. It is also not possible in the case of $\text{COMP}_{Kennedy\text{-adverbial}}$. With phrasal operators, inverse-scope readings require parasitic movement and are thus expected to be also unavailable with adverbial phrasal comparatives. If we look at (57) for the available reading of the example in (56-a), this expectation seems to be borne out. Note that the clausal counterpart in (56-b) has both the high DegP-reading and the surface scope reading.

(56) a. *Masha dolžna bežat' bystr-ee Van-i.*
Masha must run fast-COMP. Vanya-GEN.
= 'Masha has to run faster than Vanya runs.' [must > COMP]
≠ 'Masha has to run faster than Vanya has to run. ' [COMP > must]

b. *Masha dolžna bežat' bystr-ee čem Vanya.*
Masha must run fast-COMP. what(INSTR.) Vanya

= 'Masha has to run faster than Vanya runs.' [must > COMP]
= 'Masha has to run faster than Vanya has to run. ' [COMP > must]

(57)



In this LF, again, Kennedy's adverbial operator does undergo movement, which is, however, not parasitic. The distinction between Greek and Russian thus did not only prompt us to develop an analysis of adverbial comparatives with phrasal operators, it also allowed us to better understand the restrictions on their movement.

Summary of Section 2.2 Let me retrace my steps. I started out Chapter 2 with a brief investigation of different phrasal comparison operators which have been proposed in the literature. More specifically, in **Q1**, I asked what the range is of available degree operators cross-linguistically. Later in 2.1.4, I wondered whether Kennedy's operator

should be kept in the inventory of operators since it has only limited applicability. Russian suggests it should. The evidence for my $\mathbf{H1_R}$ from the beginning is the following: Genitive-marked comparatives in Russian are best analyzed using this operator because they (i) do not allow for clausal standards, (ii) do not allow DP-external readings when used attributively, and (iii) do not exhibit scope ambiguities. In those respects, genitive-marked comparatives in Russian behave like their Greek counter-parts. However, the two languages differ with respect to the availability of adverbial comparatives with genitive-marked standards. This difference is analyzed as a case of variation in the functional lexicon: In addition to the individual-based phrasal operator $\text{COMP}_{Kennedy}$, Russian has an event-based phrasal operator $\text{COMP}_{Kennedy\text{-adverbial}}$ schönfinkeled like $\text{COMP}_{Kennedy}$ with the additional event argument, while Greek has not.

What does this analysis of Russian mean for the distribution of COMP_{Heim} vs. $\text{COMP}_{Kennedy}$ thematized in 2.1.2? I suggest that we need to refine the picture shown in Beck, Hohaus & Tiemann (2012): While Heim's operator can be used for deriving predicative comparatives, and both the internal (INT) and the external reading (EXT) of attributive comparatives, and is scopally mobile, Kennedy's operator fails at deriving the external readings of attributive comparatives, but succeeds in deriving internal readings of comparatives. Let us revise Table 2.1 from 2.1.2. Table 2.6 summarizes the revised distribution of the two phrasal operators:

	-pred-	-attr (int)-	-attr (ext)-	-Mob-
COMP_{Heim}	Yes.	Yes.	Yes.	Yes.
$\text{COMP}_{Kennedy}$	Yes.	Yes.	**No.**	**No.**

Table 2.6: Refined Distribution of COMP_{Heim} vs. $\text{COMP}_{Kennedy}$

This work thus contributes to and refines the understanding of the inventory of phrasal operators in the literature. By using Russian as a test case, I have shown that $\text{COMP}_{Kennedy}$ can be used to generate internal readings of attributive comparatives that do not require parasitic movement. $\text{COMP}_{Kennedy\text{-adverbial}}$ can even accommodate genitive-marked adverbial cases of comparatives.

The following flowchart summarizes the main results of Chapter 2 and visualizes the possible process of how to decide whether the standard of comparison at hand is clausal or phrasal, which analysis to pick (the Direct or the Reduction Analysis) and how to decide which comparative operator to use.

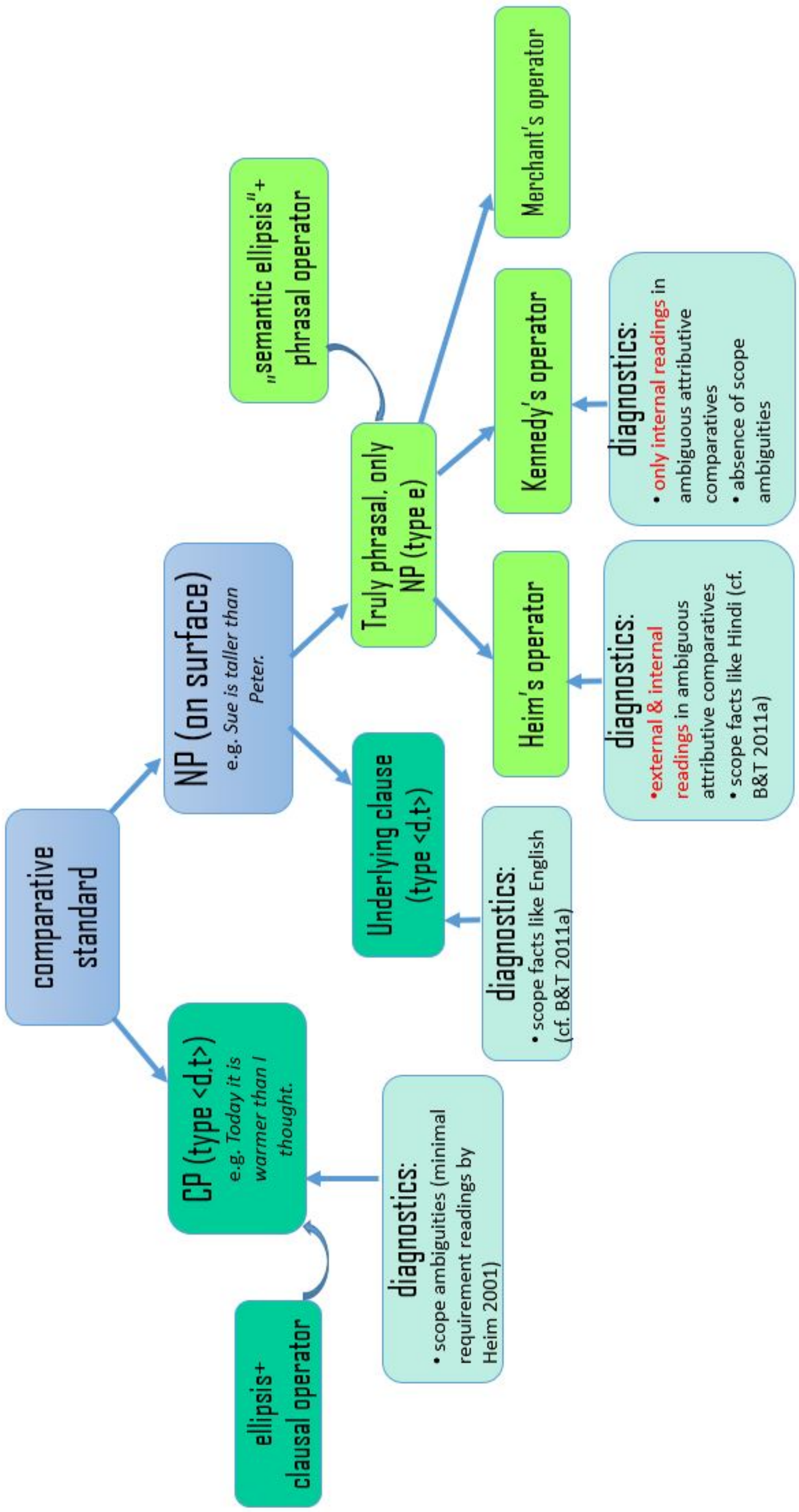


Figure 2.2: Analyzing the Standard of Comparison in Any Given Language

The flowchart should be read as follows: When we are faced with a comparative standard, we should first look at its surface structure. If it is a CP (or a comparative that we know is reduced from a clausal source), then we are faced with a case of real ellipsis and the clausal comparative operator. To test whether the candidate is really clausal, we can use Heim's scope ambiguity with, for instance, *exactly*-differentials and the comparative like the ones that exist for examples like (43). However, if we are faced with an NP (or a DP), there are two options to observe: either the comparison is underlyingly clausal. To test whether this is the case, we need the diagnostics from Bhatt & Takahashi (2011a) (cf. e.g. their example *More people read every syntax paper than every semantics paper.*). When we are sure that we are dealing with a genuinely phrasal standard, i.e. type e, then we are faced with a case of "semantic ellipsis" and a phrasal operator. The question now imposes itself of which phrasal operator to use, Heim's, Kennedy's or Merchant's. While I haven't talked about the latter in detail (which is why there is no diagnostics box under Merchant's operator), the diagnostics that can be used to distinguish between Heim and Kennedy's operators are the DP-internal vs. external readings of ambiguous attributive comparatives (marked in red in the flowchart).[15]

2.3 Comparative Operator(s) in Nenets

The section is structured as follows: first, I will give some general information and elaborate on major grammatical facts on the Tundra Nenets language (TN) in 2.3.1 and then, in section 2.3.2, show that Nenets uses COMP_{Heim} in its semantics. The proper analysis of comparatives in Nenets will follow in Chapter 4.

2.3.1 The Tundra Nenets Language

Nenets belongs to the the Uralic language family which has two branches, the Finno-Ugric and the Samoyedic languages. Tundra Nenets[16] belongs to the latter branch. It is spoken by approximately 25.000 speakers (Chrystal 1993:304). According to more recent num-

[15] Importantly, all of this only applies to standards that are integrated as an argument of the comparative operator. There are also other ways to form a comparison, namely with expressions such as *compared to* in English. Hohaus (2015) takes these to be frame setters that have different characteristics from a directly integrated argument.

[16] I will mostly refer to Tundra Nenets as just Nenets. There is also Forest Nenets that is not subject of my research.

bers by Ethnologue (`https://www.ethnologue.com/language/yrk`), the Nenets speaking population is 21,900 (2010 census), the ethnic population is 44,600 (2010 census). Not only is the Tundra Nenets language underrepresented in the linguistic, and surely in the formal semantic literature, it is also threatened (status 6b according to Ethnologue's classification). The script is Cyrillic with several special characters and diacritics (cf. on page xv for the sign key).

According to Ethnologue, Nenets is spoken in Khanty-Mansi, Nenets, and Yamalo-Nenets autonomous districts, in and around Arkhangelsk. Besides, it is spoken in Krasnoyarsk krai, in the Komi republic, in northwest Siberia, in the tundra area from north Dvina river mouth to the Yenisei river delta and scattered on the Kola peninsula.

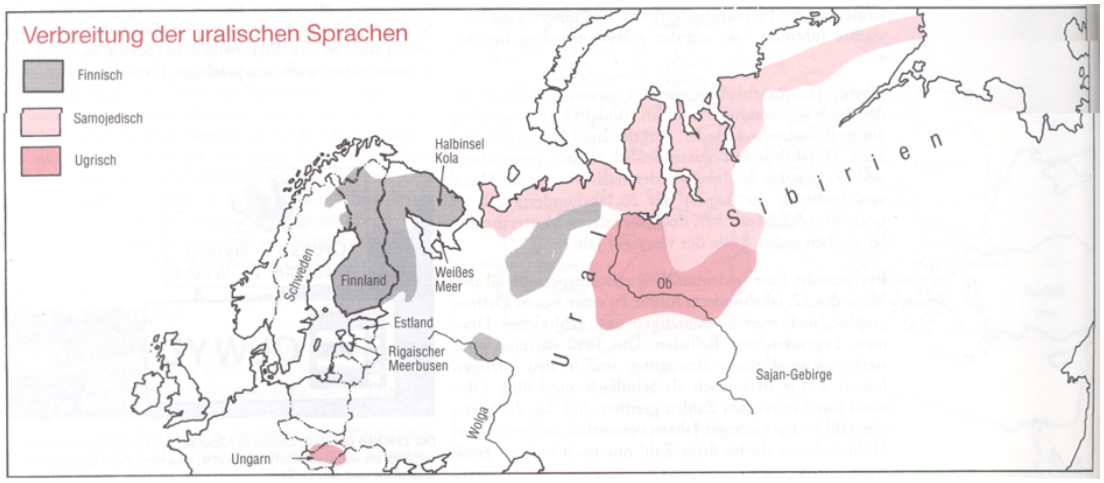


Figure 2.3: The Distribution of Uralic Languages. (Chrystal 1993: 304)

On the next map we can see how widely spread the Samoyedic languages are territory-wise, despite being minority languages. The Samoyedic languages are marked by "US" in green.

Figure 2.4: Altaic and Uralic Languages. (Source: Linguistic map of the Altaic Turkic and Uralic languages on Wikipedia)

2.3.1.1 Brief Grammatical Outline of Tundra Nenets

Nenets is a highly agglutinative language, i.e. grammatical functions are mostly marked as suffixes on words. The two main syntactic categories are verbs and nouns with some smaller classes like personal pronouns, adverbs, adjectives and postpositions. However,

> The distinction between nouns and adjectives is weak, as is that between adjectives and adverbs. (Suihkonen 2002: 171)

And:

> The borders between the parts of speech are not always clear in the Uralic languages. In all of them, there are many words that can be inflected both nominally and verbally (Suihkonen 2002: 171).

According to Salminen (1998), "Adjectives do not form a word class distinct from nouns on the basis of their inflection, though they may have derivational peculiarities." (Salminen 1998: 526).

Let us take a brief look at the characteristics of the two main categories in Nenets: nouns and verbs.

Nouns.

- the noun is inflected for number, case, absolutive and non-absolutive declension (person and number of the possessor or predestinator)
- there is no grammatical category for gender, for instance *pyda to* means 'he/she arrived'. However, there is the distinction between the 'genus humanum' and the 'genus non humanum', i.e. there are personal and 'non-personal' pronouns
- in terms of the number system (Numerus), there exists the singular, the dual and the plural
- personal suffixes and even tense suffixes can be added to the noun root

Verbs.

- the verb is inflected for mood, tense, number of objects (there is object agreement in Nenets), person and number of the subject (subject agreement)
- there are between 10 and 16 grammatical moods
- there is no distinction between the active and the passive voice

The fact that there are postpositions brings me to the next point: Nenets is quite consistently head-final. An example of a postposition phrase is in (58).

(58) *stol' ninja*
table on
'on the table' –Postpositional Phrase–

Nenets has the following word order illustrated in (59).

(59) **word order in Nenets in a regular transitive sentence**:
(Time adverbial)-subject NP-(place adverbial)-indirect object NP-object NP-(manner adverbial)-verb.
(cf. e.g. Salminen 1998, Nikolaeva 2014: 214)

Thus, the canonical word order is **SOV** with variations in the placement of the subject vs. the object. The final position of the verb is a rigid constraint in Nenets. "Except for the rather infrequent cases of afterthought [...], the verb must occupy the clause-final position" (Nikolaeva 2014: 213). According to Nikolaeva (2014), the general tendency for

verbal arguments is that the informationally new (focus) element immediately precedes the verb and the informationally old (topical) element comes before the new element, such that we get the order: Topic Focus Verb. There is a lot of positional freedom for non-verbal elements. Nenets has characteristics of a pro-drop language.

This brief outline of grammatical facts should suffice for now. I will address other important grammatical features if necessary in the course of this and the fourth chapter.

2.3.2 Marking of the Standard in Nenets

The parameter setting (B17-parameters from 1.3.2.1) for Nenets and the semantic analysis of comparative constructions will be discussed in Chapter 4. For now, I will concentrate on the subject matter of the present chapter, namely how the standard of comparison is marked and, consequently, which comparison operator Nenets uses. I will start by discussing how the comparative standard is marked and show that Nenets systematically resists clausal comparatives. Next, I will run the diagnostics introduced above (cf. the flowchart in 2.2), i.e. show evidence from attributive comparatives in Nenets that speak in favor of Heim's operator in Nenets.

2.3.2.1 Resistance to Clausal Standards

Crucially, Nenets shows a lack of clausal standards. I will now first provide a grammatical example of a comparative and then different types of comparatives that are intended to be clausal and explain why the clausal standards do not work in Nenets.

In (60), there are two grammatical examples of comparatives, the first one containing a DP-standard and the second one containing a numerical standard. These work just fine.

(60) a. *Ty wen'e-kohod ŋarka-rka.*
reindeer dog-ABL. big-RKA[17]
'The reindeer is (a little) bigger than the dog.'

b. *Polka sind'etyuh santimetr-xad jamb(-rka).*
Shelf eighty cm-ABL. long-(-RKA)
'The shelf is a little longer than 80cm.'

Next, I am illustrating Nenets' resistance to different kinds of clausal standards.

Intended: A Verb in the Clausal Standard

Elicitation of the intended clausal comparatives yielded only paraphrases like the following:

(61) *I-chin'a-n* *mah-m* *t'uku jal'a iba-rka.*
Mind-LOC.-1.SG. say-1.SG. this day warm-RKA
Literally: 'In my mind I say: this day is warmer.'
Intended: Today it is (a little) warmer than I thought.'
Comment: "I don't know how to say *čem j'a dumala* ('than I thought'). *čem* is in the way here."

(62) **Context:** This semester, Olya took more courses than usual. In addition to her studies, she also works in a bar. When talking to her friend, she complains about the huge workload and utters the sentence in (62-a):

a. *Man' manzaja-mi* *tarsi-v* *sahŋa* *man'*
I work-POSS.1.SG. too.much-POSS.1.SG.(ACC.) be.very.3.SG. I
tar'emh ni-vas' *tasla-mb'u.*
so not.-PST.1.SG.OBJ.>SG. think.DUR.CONNEG.
'My work is very hard. I didn't think so.' (Literally: 'As for myself, my work is very much too much for me, I wouldn't have thought so.')
Intended: 'For me it is harder than I thought to manage everything.'
Comment: "We don't have such difficult sentences."

The examples in (61) and (62-a) illustrate the resistance of the consultants to form a clausal standard with a verb. The informants gave paraphrases thus avoiding to construct a clausal standard. I will now illustrate what happens in Nenets if we try to explicitly put a clause, namely an CP, in the standard.

Intended: A clause (CP) in the Clausal Standard

In example (63), the ungrammaticality in the a.-version stems from the attempt to put an ablative marker on the nominalized verb.

[17] The reason why this suffix is glossed with RKA will become clear in Chapter 4. In anticipation, I can already reveal that according to my data, it cannot be a normal comparative suffix that it is claimed to be in grammars, for instance in Nikolaeva (2014) or Terezhenko (1947).

(63) a. *Vera sawa-rka-vna jaŋerna Vanja-h tara-wa-xad.*
Vera good-RKA-PROL. sing Vanja-GEN. dance-IMPF.AN.-ABL.

b. [$_{NP}$ *Vanya-h tara-wa-h-xad*] *Vera-h jaŋerna sawarka-vna.*
Vanya-GEN. dance-IMPF.AN.-GEN-ABL. Vera-GEN. sing good-PROL.
Literally: 'Vera's singing is better than Vanya's dancing.'
Intended:'Vera sings better than Vanya dances.'

Crucially, AN. stands for "action nominal", cf. Nikolaeva (2014): 108. Action nominals are essentially clausal nominalizations like in English *the **feeding** of an animal*, for instance. This means that we are dealing with a nominal standard in the comparison, i.e. a NP.

Another Nenets example is in (64).

(64) *Venera-h knigi-da Tudyi-h ty-xad ŋoka.*
Venera-GEN. books-POSS.3.SG. Tudyj-GEN. reindeer-ABL. many.
Literally: 'Venera's books are more than Tudyj's reindeer.'
Intended: 'Venera has more books than Tudyj has reindeer.'

The English target sentence would have the following structure:

(65) *Venera has more books from*[18][$_{CP}$ wh$_1$ *Tudyj has d-$_1$many reindeer*].

However, in Nenets, the structure is rather that of a predicative comparative that contains a possessive NP[19] as its standard, cf. (66). I use the English words for ease of comprehension.

(66) *Venera's books from* [$_{NP}$ *Tudyj's reindeer*] *many (are).*

From the above data, I conclude that it is impossible to have a CP in a Nenets standard of comparison.

[18]I use 'from' in order to liken the ablative marking on the Nenets standard of comparison.

[19]Since I do not have reason to assume that Nenets has overt articles, I am using NP instead of DP here. However, I do not have a strong opinion on this. In any case, this does not change the point I am making here.

Intended: An Adverb in the Clausal Standard

Another possibility to test the availability of clausal standards is to put an adverb as a standard of comparison, such as: *Today it is warmer than yesterday.* In this case, for English, we would assume a structure as in (67-b):

(67) a. *Today it is warmer than yesterday.*
b. *Today it is warmer than* [$_{\text{CP}}$ wh_1 ~~*it was* d_1*-warm*~~ *yesterday.*]

Let's look at Nenets. Both examples in (68) are fine (again, I mark the standard of comparison by a square bracket).

(68) a. *T'uku jal'a t'et'e-rka* [$_{\text{NP}}$*tej jal'a-xad*].
this day cold-RKA yesterday's(ADJ.) day-ABL.
b. *T'uku jal'a* [$_{\text{NP}}$*tej jal'a-xad*] *t'et'e-rka.*
this day of.yesterday(ADJ.) day-ABL. cold-RKA
Literally: 'This day is colder than yesterday's day.'
Intended: 'Today it is colder than yesterday.'

However, the closest translation of *tej jal'axad* is: 'than yesterday's day', i.e. a modified noun. I analyze the standard in both examples in (64) as NPs, i.e. clearly phrasal standards. Now, the real adverb meaning 'yesterday' in Nenets is *t'en'ana.* The example in (69-a) provides negative evidence showing that *t'en'ana* cannot stand as a standard of comparison. As soon as we make the standard nominal again, the example works, cf. (69-b).

(69) a. **T'uku jal'a* [$_{\text{ADV.}}$*t'en'ana*] *t'et'e-rka.*
This day yesterday cold-RKA
b. *Tjuku jal'a* [$_{\text{NP}}$*tej-xad*] *tete-rka.*
this day yesterday's-ABL. cold-RKA
Literally: 'This day is colder than yesterday's ('der Gestrige' in German).'
'Today it is colder than yesterday.'

Potentially a problematic case to the Phrasal Analysis:

The following example is a potentially problematic cases for the Phrasal Analysis in Nenets. Let us look at the English sentence and the structure of the sentence first:

(70) a. *Peter has more children than reindeer.*
b. *Peter has more children than* [$_{\text{CP}}$ wh_1 ~~*he has d-many*~~ *reindeer*].

In English, the standard is an underlying clause although we only see the noun 'reindeer' on the surface. Let us look at the following Nenets examples.

(71) *Petya-h ŋaceky-da ty-xad-anda ŋoka.*
Petya-GEN. children-POSS.3.SG. reindeer-ABL.-POSS.3.SG. many
Literally: 'Petya's children are more than his reindeer.'
Intended: 'Petya has more children than reindeer.'

Superficially, this might again look like a counter-example to the claim that Nenets only has phrasal standards. However, it is not, because the structure is again a predicative comparative with a nominal standard (again using English words for clarity of presentation):

(72) *Petya's children from* [$_{\text{NP}}$ his *reindeer*] *many (are).*

Following this data, I conclude that clausal standards are not possible in Nenets. This locates us on the right hand side of the flowchart in 2.2 at the description field "truly phrasal. Only NP (type e)".

Interim Summary: The avoidance of clausal structures by providing nominalizations or paraphrases and the negative evidence shows that Nenets notoriously resists clausal standards. This leads me to assume a direct Phrasal Analysis under which all comparatives are analyzed as being interpreted directly, according to the motto: "what you see on the surface is also what you get to interpret". This means that the nominal standard of comparison is all the semantic material we get to interpret and has type *e*. This also means that there is no ellipsis, i.e. only "semantic" ellipsis (cf. the flowchart in 2.2).

2.3.3 Evidence for COMP$_{Heim}$ in Nenets

Now the question remains which of the two phrasal operators, i.e. Kennedy's or Heim's, will be used in Nenets. Let us now zoom into the flowchart in 2.2 and apply the diagnos-

tics that we propose: First the internal and external readings of attributive comparatives, then the scope diagnostics from Bhatt & Takahashi (2011a).

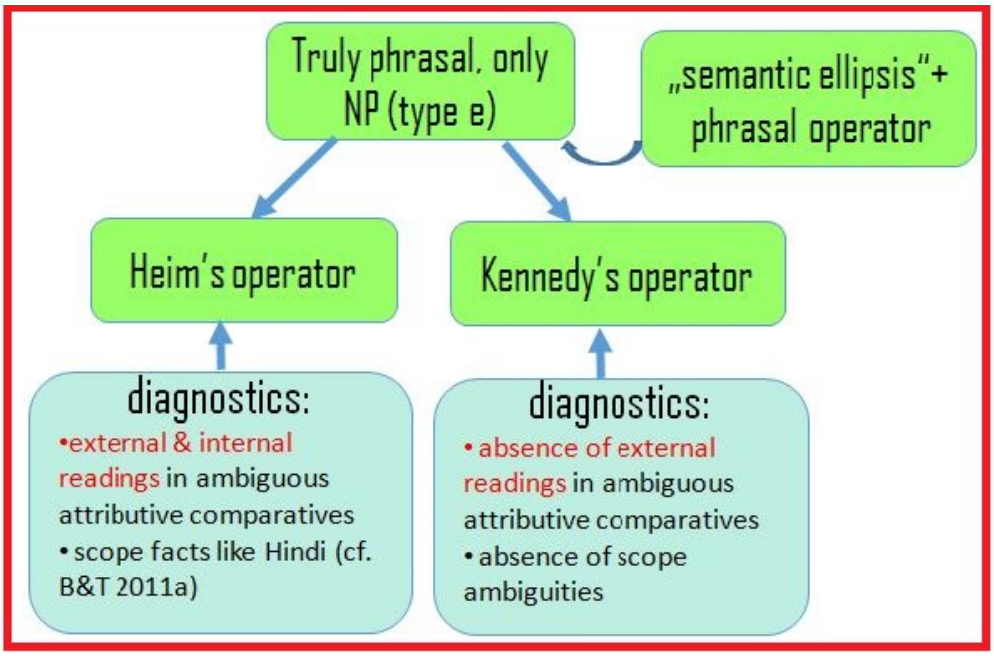


Figure 2.5: Zooming in on the Different Phrasal Operators

Internal and External Readings in Nenets Attributive Comparatives As we have shown in 2.2, Kennedy's operator can be used for attributive comparatives, but only for internal readings. The reason is that it cannot move parasitically and can thus only produce DP-internal attributive readings. Attributive external readings are available in Nenets as shown in (73-a).

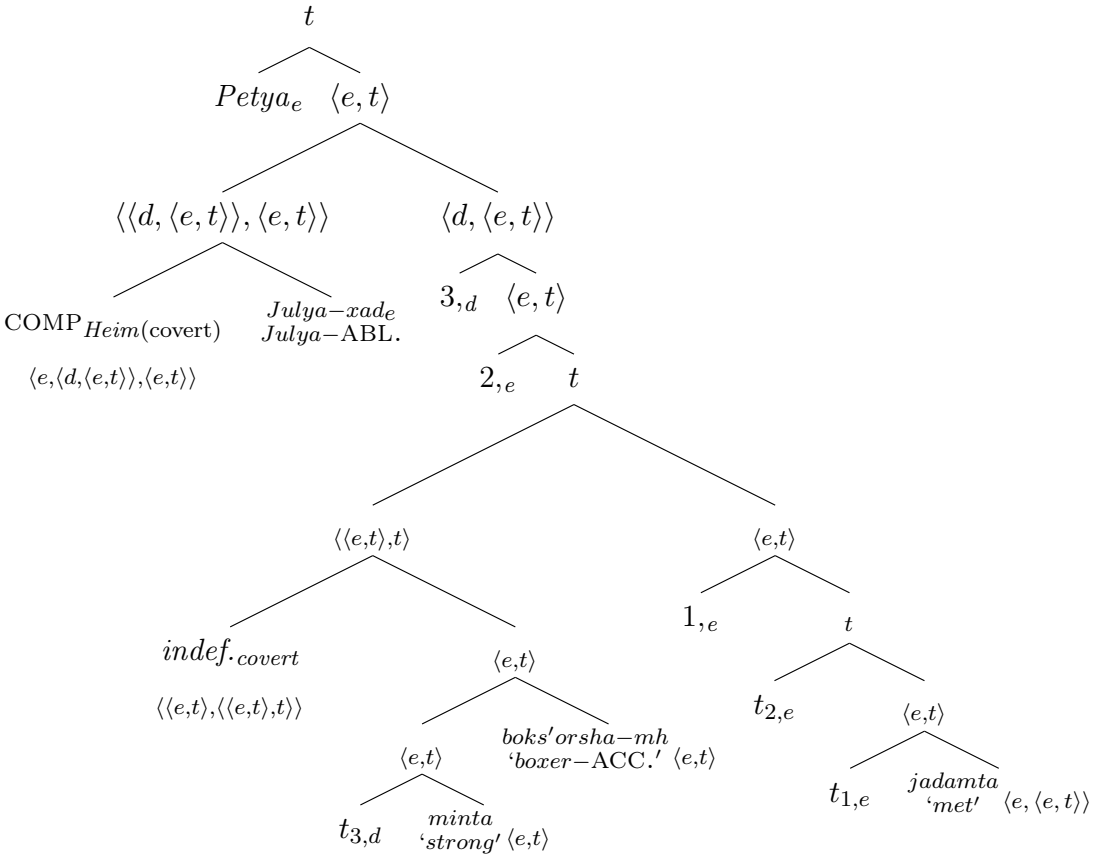
(73) **Context:** Yesterday Julya told her friend Petya that she recently met a (female) boxer who won 5 matches. Petya remembered that another (female) boxer whom he met recently even won 7 matches (i.e. the boxer which Petya met is even stronger than the one whom Julja met).

a. *Petya Julya-xad minta-rka boks'orsha-mh jadamta.*
Petya Julya-ABL. strong-RKA boxer-ACC. meet.3.SG.
'Petya met a stronger boxer than Julya.'(under the external reading)

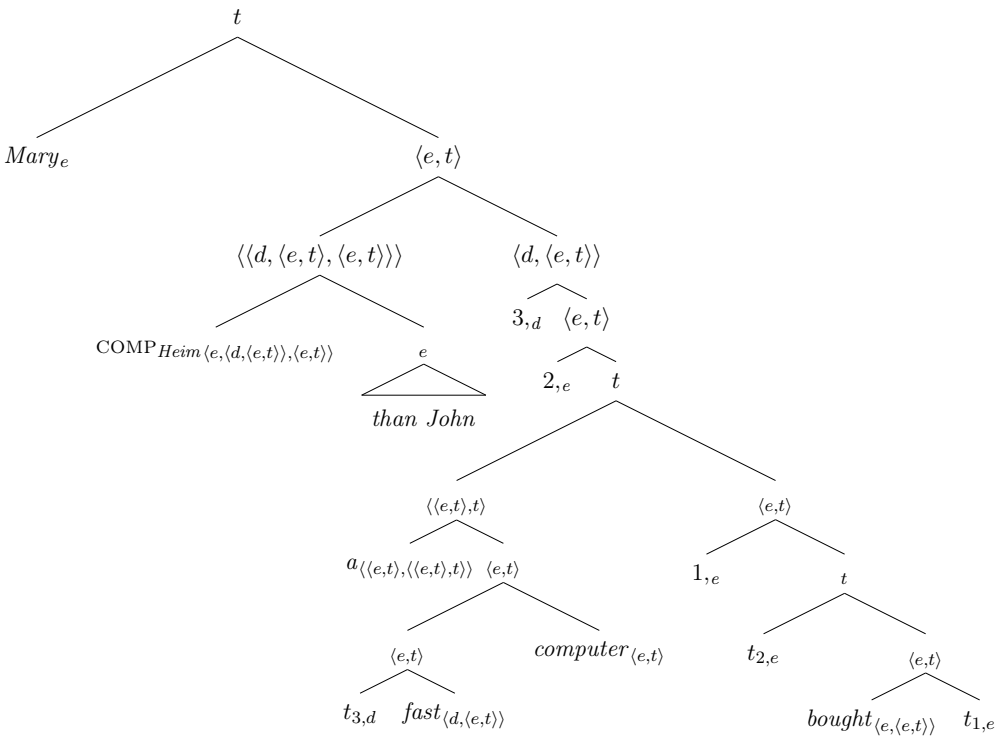
In (73-a), the reading that the context forces is the external one, where Petya met a

stronger boxer than Katya met (a d-strong boxer). Assuming Heim's operator, I propose the following LF in (74) for example (73-a). I will ignore the contribution of the suffix *-rka* for now since it will be the topic of Chapter 4.

(74) LF using COMP$_{Heim}$ for EXT of (73-a)



(75) LF using COMP$_{Heim}$ for EXT of (14), i.e. *Mary bought a faster computer than John.*



Essentially, this LF is very similar to the English one in (17) repeated in (75) except for the fact that the comparative operator is covert and that I assume a covert indefinite[20]. An additional difference to English is the position of the object *strong boxer* which comes before the verb, because the canonical verb order in Nenets is SOV. Importantly, again, we have the movement of the associate *Petya* and the movement of the degree operator along with the standard of comparison. Remember that it is this parasitic movement which syntactically derives the desired degree relation $\langle d, \langle e, t\rangle\rangle$ that the covert operator takes as its second argument (after having taken the standard *Julya*). In this case the parasitic movement is essential. In section 4.2, we will see that no movement is required for the normal predicative cases in Nenets where the degree relation is lexically provided. I will also provide a semantic calculation for this example in 4.2 after having provided all the necessary ingredients of Nenets comparatives.

[20]Note that I assume a covert indefinite here in this LF, since it is only plausible to interpret the noun 'strong boxer' as being an indefinite. This is a rough simplification. A different approach would be to have a type-shifting operator of the kind proposed in Partee (1987) and Chierchia (1998).

Applying Bhatt and Takahashi's (B & T) Diagnostics to Nenets. Let us now apply Bhatt and Takahashi's diagnostics to our situation, where we are sure that Nenets does not have $\text{COMP}_{\text{clausal}}$, but one of both phrasal operators, we expect that if Nenets exhibits the Reading 2, but not the Reading 1 (it really should not), then this provides another indirect argument in favor of Heim's operator in Nenets. Let us remember the relevant ambiguity from (11) repeated in (76).

(76) *More people read every syntax paper than every semantics paper.*

a. Reading 1: [[$\text{COMP}_{\text{clausal}}$ [than [$\lambda d.d$-many people read every semantics paper]]] [$\lambda d.d$-many people read every syntax paper]]
'There are more people who read every syntax paper than there are people who read every semantics paper.'

b. Reading 2: [every syntax paper $\lambda x.$ [every semantics paper $\lambda y.$ [x [[COMP_{Heim} than y] [$\lambda d.$ $\lambda z.$ d-many people read z]]]]]
'The least read syntax paper was read by more people than any semantics paper.'

Note that this is only a one-way diagnostics, i.e. if we only find the expected reading in (76-b) for Nenets, we can conclude that Nenets has COMP_{Heim}. If we do not find this reading for Nenets, then we cannot conclude anything. Two native Nenets speakers did get the second, but not the first reading for the sentence. This provides additional evidence that Nenets only has one operator, namely COMP_{Heim}.

Taken in tandem with our diagnostics for COMP_{Heim}, the availability of the attributive external reading, this provides further support for my conclusion that Nenets has Heim's phrasal operator. Nenets is not the only language that employs Heim's operator. Besides the obvious candidate, namely Hindi (cf. Bhatt & Takahashi 2011a; Bhatt & Takahashi 2011b), there are analyses that also use the Heim operator proposed for Persian, Tajiki and Ishkashimi by Karvovskaya (2013) and by Hofstetter (2009) for Turkish. Of course, it is not very surprising to find languages that use Heim's operator with its wider coverage (in that it can account for a wider range of constructions) than to find languages like Russian, which have both the clausal operator and the less powerful (i.e. having a smaller coverage) Kennedy operator. It is even more surprising to find Greek that has the clausal and both phrasal operators, which are distinguished by different encoding in morphology. Therefore, I confirm $\mathbf{H1_N}$ according to which Nenets has only one operator in its inventory, namely COMP_{Heim}.

Summary of Section 2.3: Answering **Q1**, we can say with Nenets and Russian that we need both phrasal operators, COMP_{Heim} and $\text{COMP}_{Kennedy}$. With our diagnostic tool, namely the availability of DP-external attributive readings in Nenets, we have shown $\mathbf{H1_N}$ to be true: Nenets has Heim's operator with its ability to undergo parasitic movement and its wider coverage of constructions. Let us now extend our Table 2.5 by adding Nenets:

English	$\text{COMP}_{\text{clausal}}$ $\text{COMP}_{Kennedy}$
German	$\text{COMP}_{\text{clausal}}$
Hindi (Bhatt & Takahashi 2011a)	COMP_{Heim}
Persian, Tajiki, Ishkashimi (Karvovskaya 2013)	COMP_{Heim}
Turkish, Thai (Hofstetter 2009, Hofstetter 2012)	COMP_{Heim}
Greek (Merchant 2009, Merchant 2012)	$\text{COMP}_{\text{clausal}}$ (*ap'oti*-clause) COMP_{Heim} (*apo*-phrase) $\text{COMP}_{Kennedy}$ (genitive-marked standard)
Russian	$\text{COMP}_{\text{clausal}}$ (*čem*-clause) $\text{COMP}_{Kennedy}$ (genitive-marked standard) $\text{COMP}_{Kennedy\text{-adverbial}}$ (genitive-marked standard)
Nenets	$\mathbf{COMP_{Heim}}$

Table 2.7: Revised Inventory of Comparative Operators in Several Selected Languages

I will come back to Nenets comparative constructions in much more detail in Chapter 4 when talking about "small degrees".

2.4 Comparative Operator(s) in German

The hypothesis $\mathbf{H1_G}$ states that German only has $\text{COMP}_{\text{clausal}}$ according to previous literature (Lechner 2004, Bhatt & Takahashi 2011a, Bhatt & Takahashi 2011b) and evidence from L1-acquisition by Hohaus, Tiemann & Beck (2014).

This section is going to be a brief review of the relevant literature, i.e. it will

not contain my own research on German. It is included for the sake of completeness when taking stock of the inventory of comparison operators in Russian, German and Nenets. Besides, it provides the theoretical background for Chapter 3, where I will present experiments on German attributive comparatives. The literature that will be reviewed speaks in favor of German having exclusively the clausal operator in (17), Chapter 1, repeated in (77).

(77) $[\![\text{COMP}_{(\text{clausal})}]\!] = \lambda D'_{\langle d,t \rangle}. \lambda D_{\langle d,t \rangle}. \text{MAX}(D) > \text{MAX}(D')$

In the degree literature, German is often treated on a par with English in terms of its comparative semantics (cf. Beck et al. 2009, Bhatt & Takahashi 2011a). Hohaus, Tiemann & Beck (2014) present a corpus study of L1-acquisition of German vs. English children provides evidence that there are, indeed, fine-grained differences.

2.4.1 English and German Comparatives in Lechner (2004) & Bhatt & Takahashi (2011a,b)

The aspect that we are interested in here is whether all comparatives, even those that look superficially phrasal, are derived from a clausal source in German (according to the Reduction Analysis, cf. Heim 1985; Lechner 2001; or Pancheva 2006), i.e. whether all comparatives only use the clausal operator. There is a substantial body of work that shows that German comparatives are all underlyingly clausal. I will focus on two aspects that show this, namely (i) case marking (accusative and nominative) and (ii) binding evidence.[21]

(i) Case Marking: Accusative and Nominative When comparing English and German, the following contrast in case marking can be observed:

[21] As Manfred Krifka points out, there is another interesting difference between English and German which will not be further discussed here: The difference between the two languages also manifests itself in a morpho-syntactic restriction between English preposition *than* and German *als*: In German, *als* also appears in the shape of a sentential complementizer, for instance in temporal sentences like *Als Maria nach Hause kam,...* meaning 'When Mary came home,...'. This possibility does not exist for the English *than*. This might be another pointer in the direction of German *als* voluntarily taking genuinely clausal standards.

(78) a. *John is older than me.*
b. **John is older than me am.* (Lechner 2004: 179)

(79) a. **John ist älter als mich.*
John is older than I(ACC.)
b. *John ist älter als ich.*
John is older than I(NOM.)
c. *John ist älter als ich bin.*
John is older than I(NOM.) am

When we compare the English (78) and the German (79), we see that while the accusative-marked standard in English cannot be succeeded by the copula, in German the standard (i) cannot be accusative-marked, cf. (79-a) and (ii) if nominative-marked, can, of course, be succeeded by the copula, cf. (79-c). A parallel contrast can be observed in (80) vs. (81).

(80) a. *John couldn't possibly be taller than himself.*
b. **John couldn't possibly be taller than himself is.* (Lechner 2004: 180)

(81) a. **John kann unmöglich größer sein als ihn selbst.*
John can impossibly taller be than he(ACC.) self
b. *John kann unmöglich größer sein als er selbst.*
John can impossibly taller be than he(NOM.) self
c. *John kann unmöglich größer sein als er selbst ist.*
John can impossibly taller be than he(NOM.) self is

For English, Lechner (2004) advocates a small-clause analysis (in order to defend the Reduction Analysis), where it is assumed that *than* can take a small clause as its complement. In this case, the small clause subject (which is also the comparative standard) can bear the accusative case, as in (78-a) and in (80-a). The subject of the small clause, 'me' in (78-a) and 'himself' in (80-a), can then take the accusative case. What is important to me is that German does not even have this problem: the accusative-marking is infelicitous. This shows that 'als' in these cases is only able to take something clausal as its complement. So far so good for the predicative cases. This is, however, different in German attributive comparatives[22]:

[22]Note that in the accusative-marked cases in German, only the DP-internal reading is possible.

(82) *Peter kennt ein-en freundlicher-en Mensch-en als sein-en*
Peter knows one-ACC. friendlier-ACC. person-ACC. that his-ACC.
Nachbar-n.
neighbor-ACC.
'Peter knows a friendlier person than his neighbor.'

In these cases one could again advocate a small-clause (SC) analysis for German, as well, which I sketch below:

(83) [Peter kennt einen freundlicheren Menschen [als **[**$_{\text{SC}}$ seinen Nachbarn ~~*d-freundlich*~~**]**]]

In this attributive case then, we again need the clausal operator in (50) in order to accommodate the small clause that contains an individual and the predicate which is elided at the surface. No phrasal operator would work, since both Heim's and Kennedy's operators only take an individual standard and not an individual plus the gradable predicate.

(ii) (Syntactic) Binding Evidence Lechner's syntactic binding evidence demonstrates that only the Reduction Analysis is at work in English and German. The following data are relevant to this question:

(84) a. *Sally introduced* ***him$_i$*** *to more friends than* [***Peter$_i$****'s sister*]$_{\text{NOM.}}$.
b. *Sally introduced* ***him$_i$*** *to more friends than* [***Peter$_i$****'s sister*] ~~*introduced* ***him$_i$*** *to*~~ <*d-many friends*>. (cf. Lechner 2004 : 214)

In these examples, the associate *Sally* is generated higher than the pronominal *him*. There is no Principle C violation. The same point can be made for German:

(85) a. *Sie* hat ***ihm$_i$*** *mehr Leute vorgestellt als* ***Peters$_i$*** *Schwester.*
she has him(DAT.) more people introduced than Peter's sister(NOM.)
'She introduced more people to him than Peter's sister did.'
b. **Er* hat **ihr$_i$** *mehr Leute vorgestellt als* ***Peters$_i$*** *Schwester.*
he has her(DAT.) more people introduced than Peter's sister(NOM.)
'He introduced more people to her than to Peter's sister.'
(cf. Lechner 2004: 214, example (87))

If however, the associate is lower than the pronoun, as in the example (86) from Bhatt & Takahashi (2011b): 150, i.e. if the pronoun c-commands the underlined associate, there is a Principle C violation. If the pronoun does not c-command the associate in and in (86-b), it can be co-referenced with the name.

(86) **Context:** Peter, Peter's sister, and Sally are taking part in a race. People are betting on their prospects.

a. **More people expect* ***him$_i$*** *to overtake* Sally *than* ***Peter$_i$****'s sister.*
(=*More people expect him$_i$ to overtake Sally than expect him$_i$ to overtake Peter$_i$'s sister.)

b. ?*More people expect* Sally *to overtake* ***him$_i$*** *than* ***Peter$_i$****'s sister.*
(= More people expect Sally to overtake him$_i$ than expect Peter$_i$'s sister to overtake him$_i$.)

The Binding Generalization (Bhatt & Takahashi 2011a: 587) that the standard is c-commanded by everything that c-commands the associate follows from the Reduction Analysis, but not from the Direct Analysis, as Lechner (2004) and Bhatt & Takahashi (2011b) show.

(87) **Reduction Analysis**:

a. LF of (86-a)
*****...than [$_{CP}$ OP$_1$ [<[many people Deg t$_1$] expect him$_i$ to overtake> Peter$_i$'s sister]]

b. LF of (86-b)
...than [$_{CP}$ OP$_1$ [<[many people Deg t$_1$] expect> Peter$_i$'s sister <to overtake him$_i$>]]

The Direct Analysis does not capture the Binding Generalization because there is no reduced clause in the *than*-XP (cf. Bhatt & Takahashi 2011b, p. 151 for more details on this).

2.4.2 Acquisition Study by Hohaus, Tiemann & Beck (2014)

Empirically motivated support for the assumption that German is a language that only has the clausal operator comes from results of an acquisitional corpus study by Hohaus, Tiemann & Beck (2014). The authors explore the time course of acquisition of English and German comparisons using a longitudinal CHILDES corpus study. The study builds on the analysis of cross-linguistic variation in the semantics of comparison from Beck et al. (2009) (introduced in 1.3.2.1 of this thesis) in combination with Snyder's theory (cf. esp. Snyder 2007). The authors work out predictions about which steps a child should go through to finally reach the state that corresponds to the adult grammar of comparison in English. A rather surprising finding is that English-speaking children produce *than*-constituents with predicative adjectives at a significantly earlier point in the acquisition process than German-speaking ones (Hohaus, Tiemann & Beck 2014: 241 ff.). This leads the authors to assume that German only has the clausal operator in (17), Chapter 1, at its disposal, while in English there also might be an easier analysis available. This is a surprising result since, as we have just seen, previous work on the topic (Lechner 2001, 2004; Bhatt & Takahashi, 2011a,b) argues that *than*-constituents in German and in English are all reduced from a clausal source. Since we are interested in German in our investigation, we will not worry about English for now. Importantly, this investigation is one more piece of evidence that shows that German only has a clausal comparative operator.

Summary of Section 2.4: As we have seen, our **Q1**: 'What is the range of available degree operators cross-linguistically?' can be answered straightforwardly for German. According to binding evidence from Lechner (2001), (2004); Bhatt & Takahashi, (2011a,b) and evidence from L1 acquisition by Hohaus, Tiemann & Beck (2014), German is a language that only has the clausal comparative, $\text{COMP}_{\text{clausal}}$, in its inventory.

2.5 Chapter Summary

This chapter is an important cornerstone for the rest of the thesis. In section 2.2, Russian genitive-marked comparatives were shown to be evidence for $\text{COMP}_{Kennedy}$, a phrasal operator with little coverage, confirming $\mathbf{H1_R}$. In this section I also clarified the status of scope ambiguities with phrasal standards. Russian comparative operators were added

to the cross-linguistic picture, cf. Table 2.5. An additional contribution is the analysis of Russian adverbial genitive-marked comparatives. I also developed the flowchart in 2.2 as a road map that can help a researcher decide what kind of comparative standard she is faced with and how to decide which kind of operator to use if the standard is genuinely phrasal.

Another contribution of the chapter was that I established a diagnostics for distinguishing COMP_{Heim} from $\text{COMP}_{Kennedy}$, i.e., the (un)availability of DP-external readings in attributive comparatives. Nenets was a test case to try this and other diagnostics. I established that the Nenets standard can only be phrasal in 2.3.2.1 and provided my own plus additional diagnostics that led me to conclude that Nenets has only COMP_{Heim}, cf. $\mathbf{H1_N}$. I added Nenets to the cross-linguistic picture in Table 2.7.

Last but not least, I discussed which operator is used in German in section 2.4. I went through the evidence provided by previous literature on the topic and concluded that German only has the clausal comparative at its disposal, cf. $\mathbf{H1_G}$.

Summarizing, I confirmed H1_R, H1_N and H1_G:

$\mathbf{H1_R}$: Genitive-marked synthetic comparatives in Russian use $\text{COMP}_{Kennedy}$.

$\mathbf{H1_N}$: Nenets uses COMP_{Heim}

$\mathbf{H1_G}$: German only has $\text{COMP}_{\text{clausal}}$

The question of marking the standard is directly linked, in the degree framework used, to the question of the comparative operator employed. Depending on whether the standard is genuinely clausal or phrasal, the operator is going to be either clausal, i.e. relating two sets of degrees, or phrasal. If it is phrasal, it is going to take the gradable relation and two individuals as input, schönfinkeled differently, depending on the operator. Referring back to Figure 1.1 that visualizes the structure of this dissertation, this chapter unravelled exciting variation in the standard argument of comparatives, in the inventory of the functional lexicon, i.e. the comparative operators, and thus in the composition and the route to the same meaning. In order to arrive at this conclusion, it was important to look at individual languages and compare them, i.e. compare comparatives. Russian, for instance, is an extremely interesting test case for phrasal operators. In comparison to Greek, we could show that genitive-marked comparisons can be adverbial in Russian, but not in Greek and developed an analysis that explains this. This brings me back to the overarching research question **Q1** and the questions (i) what the different compositional routes to the same meaning we have and (ii) which evidence in favor of these different operators we have in the languages under investigation. The final outcome, i.e. the truth conditions are comparable for both phrasal operators. However, the way leading us towards them is quite different. This becomes important when looking at scope ambiguities

or ambiguous attributive comparatives, that will be at the center of attention in the next chapter.

Chapter 3

Variation in the Standard Argument: Processing

I first remind the reader of the research question for this chapter:
Q2: In processing, do we see complexity differences derived from the standard degree theory + predictions that arise from Hackl, Koster-Hale & Varvoutis (2012)?
The hypothesis I put forward to answer Q2 is the following:
H2: According to the standard degree analysis and assumptions in Hackl et al. (2012) on individual quantifiers, attributive DP-external readings of degree constructions in German are more complex than DP-internal reading, i.e. DP-external readings are harder to process than DP-internal readings.

The following ambiguity in German attributive comparatives is at the center of investigation in this chapter: Namely the attributive DP-internal (INT) and the attributive DP-*external* reading (EXT) (cf. Lerner & Pinkal, 1995).

(1) *Maria traf* [*ein-en besser-en Boxer*] *als Peter.*
Maria met [one-ACC. better-ACC. boxer](ACC.) than Peter(NOM./ACC.)
'Maria met a better boxer than Peter.[1]'

a. INT: 'Maria met a boxer who is a better boxer than Peter.'
b. EXT: 'Maria met a boxer who is a better boxer than a boxer Peter met.'

[1] In (1) the standard of comparison 'Peter' is not marked for case. Please note that German allows the possibility of assigning either NOM. or ACC. to 'Peter'. If NOM. is assigned, we get EXT; if ACC. is assigned, we get INT. However, case marking on proper names underlies dialectal variation and is used in Southern German varieties.

More specifically, I test predictions of the standard degree theory for German attributive comparatives. Complexity differences derived from semantic theory predict that EXT should be harder in processing than INT. The central contribution of this chapter is that I provide novel experimental data from off-line and on-line experiments giving evidence that the standard theory in tandem with processing results from Hackl et al. (2012) make the right predictions for processing.

As of today, degree quantifiers have received little attention in the processing literature (but cf. Grant 2013; or Breakstone et al. 2011). This chapter makes an important contribution to the understanding of the processing of comparatives by providing an investigation consisting of four studies: an off-line forced-choice continuation task, an off-line acceptability rating study, an on-line self-paced reading study and an eye-tracking experiment. The whole enterprise is theory-driven: The degree framework leads us to assume two different LFs for the ambiguous sentence one of which is more complex than the other in different respects. With Hackl et. al (2012) and certain assumptions about complexity of structural representation (the Minimal Attachment Principle by Frazier & Fodor 1978 and Frazier & Rayner 1982 I will introduce in 3.1.3), we expect differences in processing for the two readings. Results of the forced-choice continuation study, Pilot 1, suggest that more complex structures are dispreferred. When a disambiguating context is added, as in the acceptability rating study Pilot 2, the preference seems to be overwritten. The context is also at play in on-line processing in the reading time study. The eye-tracking experiment supports the off-line results from Pilot 1 that show a preference for the less complex internal reading by revealing a preview effect for the accusative continuation.

I structure this chapter as follows: In section 3.1, the theoretical block will provide an analysis of attributive German comparatives and illustrate the experimental study by Hackl et al. (2012). Section 3.2 lays out the predictions the theory makes for processing. Pilot 1, Pilot 2 and the RT experiment will be presented together in section 3.3 since they are connected by the question of the role of context. Section 3.4 presents the eye-tracking experiment. In that section I also briefly address the structure of sentences with the disambiguating continuations like "...einer ist/...einen traf". The chapter is concluded with a summary in section 3.4.

3.1 More Theoretical Background

Remember from section 1.3.2 that we assume the 'standard' degree approach (cf. e.g. von Stechow, 1984; Heim, 2001; Beck, 2011). We treat the comparative operator as a generalized quantifier over degrees. It has the semantic type $\langle\langle d,t\rangle,\langle\langle d,t\rangle,t\rangle\rangle$. The lexical entry of the comparative operator along with a definition of the maximality operator MAX are repeated in (2). The gradable adjective contains the measure function μ which has the type $\langle e,d\rangle$. Measure functions assign a unique degree to individuals, for instance a degree of height as exemplified by (3). The lexical entry of the gradable adjective introduced in Chapter 1 is given again in (4) (type $\langle d,\langle e,t\rangle\rangle$). The degree head (alias comparative operator) forms a DegP with *than*-clause. In order to resolve a type mismatch with the gradable adjective, the whole DEGP undergoes QR and is moved to an interpretable position.

(2) $[\![\,\text{COMP}_{(\text{clausal})}\,]\!] = \lambda D_{\langle d,t\rangle}.\ \lambda D'_{\langle d,t\rangle}.\ \text{MAX}(D') > \text{MAX}(D)$,
where $[\![\text{MAX}]\!] := \lambda D_{\langle d,t\rangle}.\ \iota d\ [D(d)\ \&\ \forall d'\ [D(d') \rightarrow d' \leq d]]$

(3) $[\![\,height\,]\!] = \lambda$x.x's HEIGHT

(4) $[\![\,tall\,]\!] = \lambda d.\lambda x_e.\mu_{height}(x) \geq d$
$= \lambda d.\lambda x_{.}\, x$ is d-tall (simplified)

After having introduced the basic ingredients of a comparative within the standard framework, let us now look at degree constructions in German, in particular at the analysis of the investigated case, the attributive comparative.

3.1.1 Attributive Comparatives in German

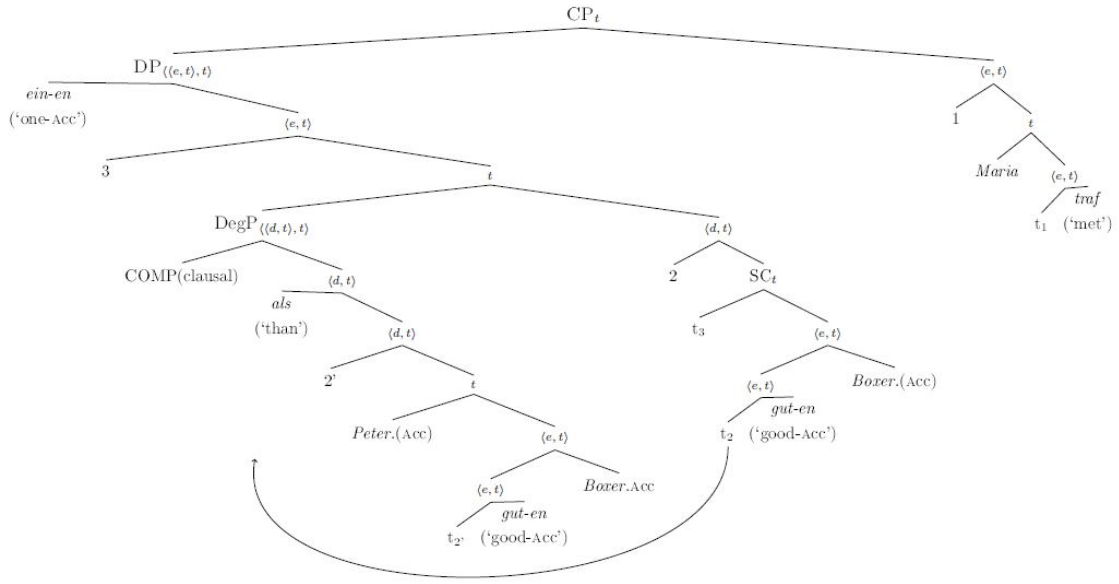
As I have already shown in section 2.4, German is often treated on a par with English in terms of its comparative semantics (cf. Beck et al., 2009; Bhatt & Takahashi, 2011a). However, empirical support for the assumption that German is a language that only has the clausal operator in (2) comes from results of an acquisitional corpus study by Hohaus et al. (2014) already discussed in section 2.4.2 of Chapter 2.

For the current series of experiment, I will focus on German and will assume, according to the facts presented in section 2.4, that German has only the clausal comparative

operator at its disposal. This means that we discard a Phrasal Analysis for German. We thus do not need to worry about which phrasal operator to use (from Heim 1985 or Kennedy 1997), nor do we need to discuss the implications of such an analysis (which might be simpler than the clausal one) on the processing predictions[2].

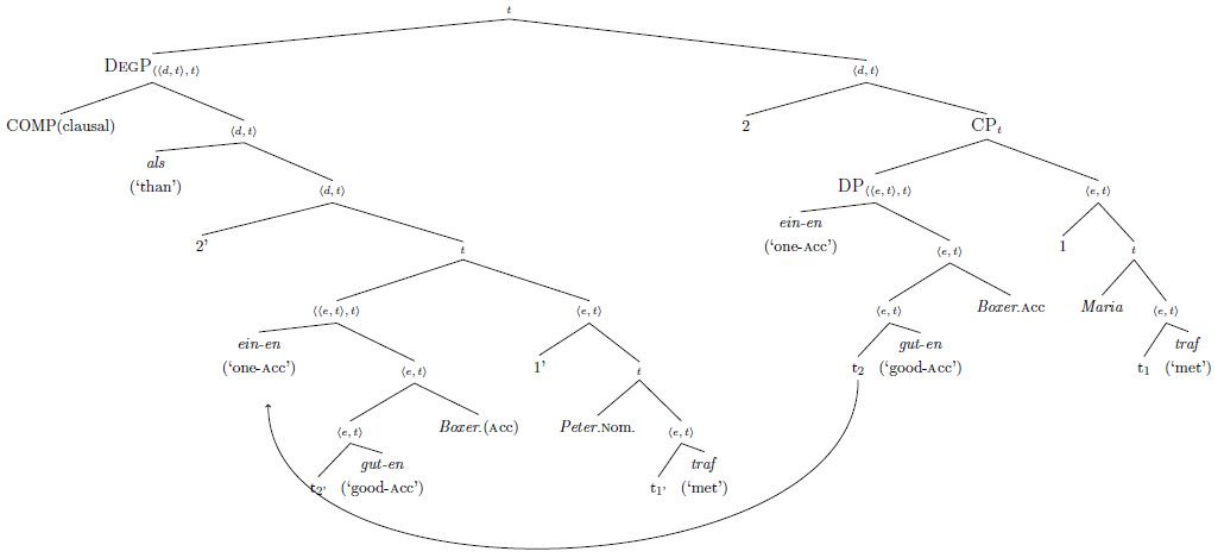
Now, acting on the assumption that German only has the clausal operator in (2), and assuming the relational gradable adjective in (4), we arrive at the LF in (5) for the internal derivation and in (6) for the external derivation of our example in (1). One of the movements that takes place is the QR of the indefinite DP (indicated by an arrow in both derivations) from the object position, which is necessary in both cases. The other type of movement that is also present in both trees is *wh*-movement of a covert *how* (which can be overt in some languages, like e.g. Russian, cf. Pancheva 2006; Berezovskaya 2014) to create degree abstraction. I also include a bigger version of these trees in the Appendix A on page 188 for better readability.

(5) LF for Int of (1) *Maria traf einen besseren Boxer als Peter.*



[2]Repeatedly, I refer the interested reader to Schneider (2017) who investigates the processing of English 'than'-phrases.

(6) LF for EXT of (1) *Maria traf einen besseren Boxer als Peter.*



Additional structural complexity in (5) comes from internal subjects in DPs (leaving the trace t_3) in (5) (cf. Heim & Kratzer 1998, 226-228) . However, since I am assuming this for the derivation of INT, it is also implicitly assumed for the external derivation, (6), I just do not indicate it there to not complicate the structure unnecessarily. Since this structural assumption applies to both readings, I will be ignoring it forthwith, because it does not affect any of my arguments, predictions and conclusions.

Note that in the derivation of INT there is a small clause (SC) contained in the DP. This small clause is truth-value denoting and provides the right type for degree abstraction to apply and to subsequently supply $\text{COMP}_{(\text{clausal})}$ with the right type of argument, namely the characteristic function of the set of degrees (type $\langle d, t\rangle$). Another remark is that German is a head-final language when it comes to VPs, that is why the verb comes last in the LFs provided.

The resulting truth conditions for the internal reading are given in (7), for the external reading in (8).

(7) INT:
$\exists x[meet(Maria, x)]\&\text{MAX}(\lambda d.boxer(x)\&\mu_{quality}(x) \geq d) >$
$\text{MAX}(\lambda d'.boxer(Peter)\&\mu_{quality}(Peter) \geq d')]$

(8) EXT:
$\text{MAX}(\lambda d.\exists x[boxer(x)\&meet(x, Maria)\&\mu_{quality}(x) \geq d]) >$
$\text{MAX}(\lambda d'.\exists y[boxer(y)\&meet(y, Peter)\&\mu_{quality}(y) \geq d'])$

As already discussed for a different example on pp. 35 ff. in Chapter 2 when introducing different phrasal operators, the position of MAX taking scope over ∃ in both the matrix and the standard clause actually yields the reading where we compare the strongest boxer that Mary met to the strongest boxer that Peter met under EXT. Under INT, we compare the maximal degree of strength of an individual whom Maria met and who is a boxer with the maximal degree of strength of Peter who is a boxer. While this is one possible reading that people get for the sentence, it is not the only one, as has already been discussed for computer-example in (14) in Chapter 2. The following reading might also be existent for EXT:

(9) $\exists x, y[\text{MAX}(\lambda d.boxer(x)\&meet(Maria, x)\&\mu_{quality}(x) \geq d) >$
$\text{MAX}(\lambda d'.boxer(y)\&meet(Peter, y)\&\mu_{quality}(y) \geq d')]$

This is a reading can be paraphrased as follows: "There is a (specific) boxer Mary met who is stronger than a (specific) boxer Peter met.". This reading would also be true in a scenario where Maria met a strong boxer and Peter met a weak and a super strong boxer. Importantly, I believe that this complication on the external reading does not change the facts about the differences between the two Logical Forms in (5) for INT vs. (6) for EXT and that the analysis of the indefinite is not central to the ambiguities investigated here. For this reason, I will set this issue aside and concentrate on the differences that are relevant for my predictions in processing.

As already explained, QR of the object indefinite and the *wh*-movement is needed in both readings. What differs is the QR of the DegP: It applies in the semantic derivations of both readings, but crosses more nodes in the external case. The derivation of the internal reading is less complex on several levels: Firstly, the DegP moves across a sentence boundary (CP) in the external case, but only across a DP-boundary under the internal reading. Hackl et al. (2012) show that longer QR of individual-type quantifiers in object position is costlier than shorter QR. This is the crucial parallel between Hackl et al.'s and the present case. I will elaborate on this in the next subsection. Secondly, the LF of the internal reading has less nodes in total (namely 35 nodes for INT vs. 39 nodes for EXT). In short, the structure that corresponds to INT is less complex in two

senses: it has a shorter QR that happens within the DP and it is the smaller structure overall.[3]

3.1.2 Hackl et al. (2012): QR of Individual Quantifiers in Processing

Hackl, Koster-Hale & Varvoutis (2012) investigated the connection between Antecedent-Contained Deletion (ACD) and the integration of a quantifier in object position. An example for an ACD-sentence is given in (10).

(10) *I read every novel that you did.* (Heim & Kratzer 1998: 198)

(11) *I read every novel* $[_{\text{RC}}$*that you did* ~~*read*~~$]$.

The sentence under investigation contains a relative clause (RC) which is attached to the direct object DP. The VP inside the RC is, however, elided, cf. (11). This gives rise to a configuration where an elided constituent is contained inside the constituent that serves as its antecedent, hence the name ACD. ACD is often used as an argument in favor of the QR approach since it elegantly resolves the dilemma of the elided constituent being contained within its antecedent by movement. The problem of quantifiers in object

[3] As Sigrid Beck points out, there would be an added interest in the research question whether INT is easier than EXT in terms of processing if there were an analysis according to which the internal reading is not simpler than the external reading. A prominent candidate is Schwarzschild (2008) with an alternative analysis that does not rely on degrees, which is known as the A-not-A analysis. Here is my take on the resulting truth conditions for our sentence in (1) within Schwarzschild's framework:
truth conditions:
a. INT: $\exists\theta[good(x,\theta)\&boxer(x,\theta)\&meet(Mary,x)]$
$\wedge$ for boxer $(Peter,\theta)\&meet(Mary,Peter) : \neg[good(p,\theta)]$
Verbalized: 'There is some goodness-threshold θ: x (who is a boxer and whom Mary met) meets or exceeds it and Peter (who is a boxer and whom Mary met) does not meet or exceed it.'
b. EXT: $\exists\theta[good(x,\theta)\&boxer(x,\theta)\&meet(Mary,x)]$
$\wedge$ for boxer$(y,\theta)\&meet(Peter,y) : \neg[good(y,\theta)]$
verbalized: 'There is some goodness-threshold: x (who is a boxer and whom M met) meets or exceeds it and y (who is a boxer and whom Peter met) does not meet or exceed it.'
As far as I can see, there is no straightforward way to transfer his analysis to the two readings of attributive comparatives, since Schwarzschild does not discuss such attributive cases. Besides, neither the exact syntax nor the composition that he would assume for the standard clause are clear. Since my approach is heavily dependent on the assumed syntax with the exact movements and on counting nodes, I am leaving the comparison to his theory as an aside with potential for further investigation.

position is also a very well-known one. It can be either solved by a QR-approach or a flexible-types approach (for references cf. Heim & Kratzer 1998, 178-208).

Hackl et al.'s data from real-time sentence processing lead the authors to assume that the QR-approach has explanatory advantage over the flexible types approach. They found that facilitation of ACD resolution by *every* interacts with the size of the elided VP in much the same way that quantifier scope interacts with the size of the elided VP.

Crucially for me, one of their results is that there is also good reason to assume that longer QR of individual-type quantifiers like *everyone* (type $\langle\langle e,t\rangle,t\rangle$) in object position is costlier than shorter QR. The longer the movement, the costlier it is in processing as compared to shorter movements. The link to the present case is evident: I analyze the German comparative operator as a generalized quantifier over degrees (type $\langle\langle d,t\rangle,t\rangle$), thus the parallel to generalized quantifiers over individuals: under EXT, the DegP needs to undergo longer QR than under INT being thus costlier than INT. The movement of the DegP in (6) is longer and crosses a CP-border, while the movement in (5) is shorter and stays within the DP. Thus, EXT is costlier in processing than INT.

The standard degree approach in tandem with Hackl et al.'s findings thus have predictory power that I will use to make predictions for processing. Let me now briefly introduce another important ingredient in linking the complexity assumptions to processing, namely the Minimal Attachment Principle. After that, we are well equipped to proceeding to the predictions for processing.

3.1.3 Minimal Attachment Principle (Frazier & Fodor 1978; Frazier & Rayner 1982)

The Minimal Attachment Principle is one of heuristics proposed in the frame of the influential Garden-Path Theory. A garden-path is a syntactic misanalysis. A famous example that leads the parser into such a misanalysis is: "The horse raced past the barn fell." This approach is a detailed explicit theory of how perceivers reanalyze a sentence if the first analysis proves to be incorrect. Important principles are Minimal Attachment, Late Closure, Minimal Revisions. Let us look more closely at the Minimal Attachment heuristic.

According to the 'Minimal Attachment' heuristic (cf. Frazier & Fodor 1978; Frazier & Rayner 1982), smaller structures are easier for the parser. This principle states that each input word should be attached using the fewest nodes consistent with the grammar. In other words, listeners and readers initially attempt to interpret sentences in terms of

the simplest syntactic structure consistent with the input that is known at the moment.

Transferring the principle to the case at hand, the parser builds the simplest syntactic structure possible. Therefore, the smaller structure, namely the one that derives INT, should be preferred by the parser as the easier one when compared to EXT.

3.2 Predictions for Processing

It is commonly assumed that the complexity of semantic representations is reflected in processing complexity. In line with this assumption together with results by Hackl et al. (2012), we predict that based on the differences just discussed, EXT should be more difficult to process than the INT. I repeat the reasons in turn: (i) longer movements of the quantifier are more costly in the processing than shorter movements (cf. Hackl et al. 2012) and that (ii) smaller structures are easier for the parser (cf. Frazier & Fodor 1978; Frazier & Rayner 1982).

To summarize: EXT should be more costly in processing than INT due to (i) longer movement of the DegP in the external case, namely across a CP-boundary, and not just a DP-boundary and (ii) the overall differences in the number of nodes. From this I deduce the following **Prediction I**:

Prediction I
EXT is **more difficult to process** that **INT** due to increased semantic complexity (movement and structure size).

This prediction should be testable in on-line and off-line processing. I will elaborate on this general prediction as we proceed to the experiments.

The following prediction rests on **Prediction I** supplemented by the assumption that relative preferences of alternative readings of a given sentence are affected by how complex their LFs are. Therefore, the internal reading should not only be simpler to process, but should also be preferred over the external reading in case of an unresolved global ambiguity. This is formulated in **Prediction II**:

Prediction II
INT is preferred to EXT because of the differences in complexity of the LF.

The first set of experiments in section 3.3 will explore the role of preferences and the role of context when it comes to these ambiguous structures. The eye-tracking experiment in section 3.4 tests structures that were disambiguated by continuations continuations of the form "...einer ist./...einen kennt." ('...one is./...one knows.') instead of context. This experiment thus aimed at testing Prediction I directly. It reveals a preview effect for the disambiguation towards EXT pointing to increased complexity.

3.3 The Role of Context: Pilot 1, Pilot 2, Reading Time Study

Here is a short preview of what this block of experiments show: Pilot 1 and Pilot 2 were done in preparation for the Reading-Time (RT) experiment. Pilot 1 that used the continuations '...einer ist./...einen kennt.' ('...one is./...one knows.') shows that EXT is dispreferred compared to INT. In Pilot 2, an acceptability rating study where a disambiguating context is added, the preference from Pilot 1 seems to be overwritten. The RT study yielded a null effect. I will provide an explanation for this in section 3.3.3[4].

3.3.1 More complex structures are dispreferred off-line: Pilot 1

This experiment set out to determine whether an off-line preference exists for one of the readings under examination. For that sake we used a forced-choice continuation task in which participants chose from two possible continuations by picking the more natural one. This task did not involve any contexts, i.e. the comparatives were presented out of the blue and were ambiguous with respect to their reading. By picking a continuation, the comparatives were disambiguated towards the internal or the external reading.

I will now lay out the method and the material that were used, and also talk about the participants and the procedure of the experiment. Subsequently, the results are provided and discussed. I will proceed in this way for all the other experiments, as well.

[4]This section is based on Berezovskaya & Hörnig (2019).

Method

Materials: 24 target sentences were constructed[5]. A sample item is provided in (12).

(12) *Maria traf* [*einen besseren Boxer*] *als Peter...*
Maria met [a better boxer]-Acc than Peter...

a. ... *ein-er ist.*
... one-Nom. is

b. ... *ein-en traf.*
... one-Acc. met
'Maria met a better boxer than Peter... (a)... is. / (b)...met.'[6]

Knowing that we would need a lot of filler items to distract from the task, we did not want the subjects to see more than 10 target stimuli. We constructed 24 lists using the following rationale: we assigned ten targets to each of the 24 lists. Each list started with the item sharing the number of the list, followed by the next nine targets, e.g. list 19 contained the items 19 to 24 and 1 to 4. To conceal the target sentences in an effective way, 30 filler items were constructed. The 30 fillers, together with 10 gaps for 10 targets, were put into a single random sequence such that each consecutive pair of gaps was separated by three or four fillers. The 10 gaps for each list were filled by the respective 10 targets, each one in a randomized order of its own.

The two possible continuations (a) and (b) were placed underneath the target sentence one under the other. The reading presented on top was counterbalanced to control for an possible preference to choose, for instance, the first one.

Participants and procedure: 34 native speakers of German took part in the experiment for a payment of €5. The data of nine participants were excluded from the analysis because they had not completed the task. The remaining 25 persons had a mean age of 31.4 years, ranging from 24 to 69 years; 14 participants were female. Hence, the analysis is based on 25 participants and 24 items.

[5] Appendix B contains all the target sentences and also the contexts that accompanied Pilot 2 and the RT study.

[6] Manfred Krifka (p.c.) brought to our attention that the sentences in Pilot 1 with the continuations in (a) and (b) ("einer ist" and "einen traf") have a different structure from the ones without the continuations, i.e. the ones in (1). This becomes clear when consulting case marking on the standard of comparison: While 'Peter' in (1) can be case-marked by the accusative ("den Peter") to yield the internal reading, or the nominative ("der Peter") to yield the external reading, the standard 'Peter' in (1) can only be nominative-marked under both continuations. I will discuss this point in more detail in section 3.4.1 before introducing the eye-tracking experiment that tests these structures.

The experiment was conducted online with the help of the software OnExp[7]. After an instruction, which explained the experiment, and a short practice phase, participants were asked to choose the continuation which according to them would be considered more suitable and to do so as spontaneously as possible. The participants chose one or the other continuation by clicking on a box next to the respective continuation.

Results and discussion In order to determine whether one of the two readings was preferred over the other, one-sample t-tests were conducted. The chosen reading was coded with 1 (INT) and 0 (EXT), respectively. The readings were then aggregated per participant (t_1-test) or item (t_2-test). The frequency scores (relative frequencies of INT) were arcsine-square-root transformed. The t-tests showed that the proportion of 66 % choices for INT significantly exceeds random choices of 50 % (transformed value: .79): $t_1(24) = 2.77$, $p = .01$; $t_2(23) = 4.23$, $p < .001$[8]. The results are summarized in Table (12).

Pilot 1 choices in %:

INT	EXT
66%	34%

Table 3.1: Results of Pilot 1

In line with our complexity considerations, the INT continuation is preferred over the EXT continuation ($p < .001$).

The statistically significant result shows that, when the ambiguous sentence is presented out of the blue without context, the continuation that disambiguates towards the internal reading is more frequently chosen. We take this as clear evidence for the existence of an off-line preference towards the internal reading. **Prediction II** is thus borne out by the experiment.

3.3.2 Introducing disambiguating contexts: Pilot 2

Pilot 2 was designed to evaluate the material for the RT study and to test for the acceptability of INT vs EXT in context. This was done by creating contexts that preceded the target sentence of the type in (1). This context manipulation requires some explanation:

[7]For information on this software see: `http://onexp.textstrukturen.uni-goettingen.de/`

[8]The t-test was thus non-standard. It did not test the choice of INT vs. EXT but rather INT or EXT against 50% of random choices.

The assumption that we make here is that context guides interpretation in that it clearly disambiguates towards one or another reading.

Pilot 2 pursued a twofold goal. (i) It was designed to show that the contexts do their job, i.e. that they disambiguate the interpretation of the comparative as intended. (ii) Reacting to the outcome of Pilot 1, we wanted to test whether the unambiguously internal reading would get higher acceptability ratings than the unambiguously external reading. We elaborate on these two sub-goals briefly: Concerning (ii), we refer to Pilot 1, where we found a preference for the internal compared to the external reading when ambiguous comparatives were presented without context. We interpret this preference for the internal reading as a preference for the less complex interpretation. Adding a disambiguating context should have a strong influence on how the comparative is interpreted, i.e. it might weaken the effect seen in Pilot 1. However, the context should not influence the difference in complexity between the two readings once disambiguated. We therefore expected that the simpler INT is still easier than the more complex EXT and we thus hypothesized that the simpler internal reading would be judged more acceptable than the external reading (we pick up this hypothesis again in Section 3.3.3 below). To test this hypothesis, we provide the target sentences with contexts that match the targets in the conditions INT/+MATCH and EXT/+MATCH.

As to (i), we want to gain evidence that readers actually adopt the internal or the external reading after the respective context. To this end we added conditions with a mismatching context given the induced readings in the conditions INT/−MATCH and EXT/−MATCH. The simple idea behind this is that matching contexts will be judged substantially more acceptable than mismatching contexts. Since we conceive of the mismatching contexts as control conditions, we tested a smaller number of mismatching contexts than matching contexts.

Method

Materials: We used the 24 target sentences from Pilot 1 and constructed four contexts for each of the targets, exemplified in (13). The target sentences from Pilot 1 were supplied with a continuation after the standard of comparison (cf. 'und darüber freut er sich' in (13)). These supplements will serve as a spillover region in the RT study reported below in Section 3.3.3.

(13) *Peter traf* [*ein-e stärkere Boxer-in*] *als Julia und darüber freut er sich.*
Peter met [one-F. stronger boxer-F.ACC.] than Julia and thereabout rejoices he himself

'Peter met a stronger boxer than Julia and he is happy about it.'

a. **Int/+Match**: *Gestern prahlte Julia vor ihrem Kumpel Peter, sie habe 5 Boxkämpfe mit einem Knockout gewonnen. Peter erinnerte sich, dass eine Boxerin, die er neulich getroffen hat, bis jetzt sogar schon 9 Boxkämpfe durch ein Knockout gewonnen hat.*
'Yesterday, Julia bragged in front of her buddy Peter that she had won 5 boxing matches by knockout. Peter remembered that a female boxer whom he recently met had already won 9 boxing matches by knockout.'

b. **Ext/+Match** : *Gestern erzählte Julia ihrem Kumpel Peter, sie habe sich mit einer Freundin getroffen, die für 5 Knockouts verantwortlich war. Peter erinnerte sich, dass eine Boxerin, die er neulich getroffen hat, sogar schon 9 Knockouts verzeichnen konnte.*
'Yesterday, Julia told her buddy Peter that she met with a friend of hers who was responsible for 5 knockouts. Peter remembered that a female boxer whom he recently met, could even claim 9 knockouts for herself.'

c. **Int/−Match**: *Gestern prahlte Julia vor ihrem Kumpel Peter, sie habe schon 9 Boxkämpfe mit einem Knockout gewonnen. Peter erinnerte sich, dass die stärkste Boxerin, die er je getroffen hat, bis jetzt nur 5 Boxkämpfe gewonnen hat.*
'Yesterday, Julia bragged in front of her buddy Peter that she had won 9 boxing matches by knockout. Peter remembered that the strongest boxer that he had ever met had only won 5 boxing matches so far.'

d. **Ext/−Match**: *Gestern erzählte Julia ihrem Kumpel Peter, sie habe sich mit einer Freundin getroffen, die für ganze 9 Knockouts verantwortlich war. Peter erinnerte sich, dass die beste Boxerin, die er bis jetzt getroffen hat, lediglich 5 Boxkämpfe mit einem Knockout gewonnen hat.*
'Yesterday, Julia told her buddy Peter that she met a friend of hers who was responsible for as many as 9 knockouts. Peter remembered that the best boxer that he had met previously, had only won 5 boxing matches by knockout.'

The context in (13-a), Int/+Match, induces the internal reading of the comparative: Peter met a stronger boxer than Julia is. The context matches the target because the female boxer Peter met won 9 matches whereas Julia won 5 matches. The context in (13-b), Ext/+Match, induces the external reading of the comparative: Peter met a better boxer than Julia met. The context matches the target because the boxer Peter

met won 9 matches whereas the boxer Julia met won 5 matches.

The mismatching context of the control of the internal reading in (13-c), INT/–MATCH, induces an internal reading and mismatches the target because the boxer Peter met won 5 matches whereas Julia won 9 matches. The mismatching context of the control with the external reading in (13-d), EXT/–MATCH, induces an external reading and mismatches the target because the boxer Peter met won 5 matches whereas the boxer Julia met won 9 matches.

Since we wanted our subjects to judge no more than 12 experimental items, the total set of 24 experimental items was split into two halves. In order to test twice as many matching than mismatching contexts, we implemented a Latin square design for either half of items, pretending that there were six conditions. The four item variants of the twelve items in a subset were assigned to six lists in a way that eight items on a list instantiated the two matching conditions (4 × INT/+MATCH and 4 × EXT/+MATCH) and four items instantiated the mismatching controls (2 × INT/–MATCH and 2 × EXT/–MATCH).

Participants and Procedure: 85 native German speakers took part in the experiment, for a payment of €5. Six participants were excluded from the analysis because they did not complete the experiment. The remaining participants had a mean age of 27.2 years, ranging from 20 to 63 years; 50 of them were female. The analysis is based on 79 participants and 24 items.

Participants judged the sentences in the given context on a 4-point Likert scale. The experiment was conducted online with OnExp. Figure 3.1 shows how the display of a trial looked like.

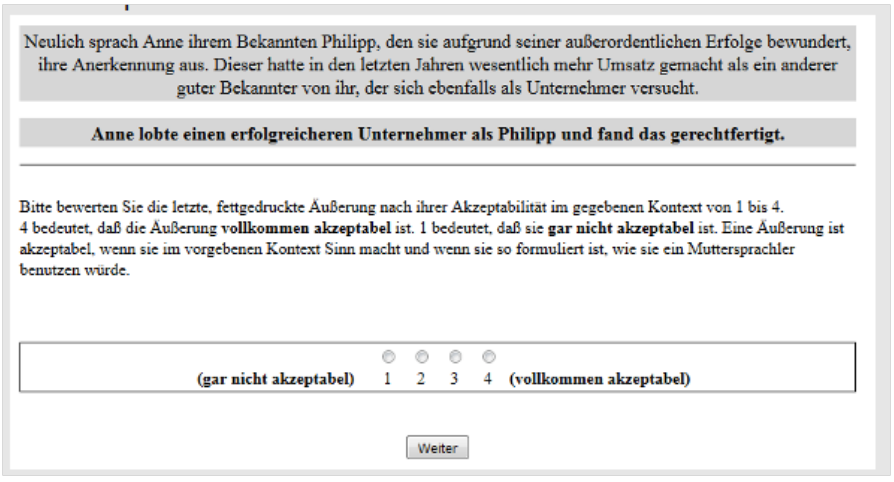


Figure 3.1: Sample display of an item presented in Pilot 2

The instructions following the context and the target sentence printed in bold read as follows in English:

> "Please evaluate the last utterance in bold according to its acceptability in the given context from 1 to 4. 4 means that the utterance is **completely acceptable**. 1 means that it is **not at all acceptable**. An utterance is acceptable when it makes sense in the given context and when it is formulated in a way in which a native speaker would use it."

Results and discussion In order to test whether the contextually induced internal reading is judged more acceptable than the contextually induced external reading, we compared the mean acceptability ratings for matching contexts: 3.08 for INT/+MATCH and 3.12 for EXT/+MATCH. As is already evident from the two means, there is no difference in acceptability between the two readings, as confirmed by the t-test: $t_1(78)$ and $t_2(23) < 1$.

I conclude that there is no difference in acceptability of contextually disambiguated comparatives corresponding to the interpretation preference observed in Pilot 1 for ambiguous comparatives presented without context. In particular, the simpler internal reading is not judged more acceptable than the more complex external reading. We will see in the next section whether an on-line measure like reading times reveals effects of the difference in complexity which were not visible in the off-line measure used in Pilot 2, namely acceptability judgments.

There is, however, evidence that the contexts did their job: While items with matching contexts were judged acceptable, 3.08 and 3.12 for the internal and the external reading, the controls with mismatching contexts, INT/−MATCH and EXT/−MATCH, were considered inacceptable, 1.13 and 1.16.

Referring to our sub-goal (i), the context manipulation, Pilot 2 thus succeeded. Concerning sub-goal (ii), the context seems to have a much more important role to play: the structural differences between the two readings seem to be overwritten. I will discuss this point in more detail later.

3.3.3 The Self-paced Reading Study

The self-paced reading time study (RT study) was designed to test **Prediction I** that EXT is harder to process on-line than INT due to the greater complexity in terms of the larger number of nodes in the structure and the more extensive movement of the degree quantifier. In other words, the RT study tested whether the differences in structural

complexity discussed in subsection 3.1.1 manifest themselves in on-line processing. By implementing a moving window technique, we measured word by word reading times on the target sentences to determine whether and where the difficulties arise during reading. We expect longer reading times for the external reading beginning with the preposition *als* ('than') of the standard of comparison and possibly lasting until the spillover region, i.e., the clause following the comparative beginning with the connective *und* ('and').

Apart from differences in complexity, we acknowledge another possible source of processing difficulties. Processing difficulties due to an enhanced structural complexity may arise even if the processing of a target sentence is contextually guided towards the induced reading from the very beginning, i.e., the contextually inappropriate structure is never considered during processing. We cannot rule out, however, that syntactic parsing is ignorant about the impending semantic mismatch and thus susceptible to the preferred analysis in agreement with the internal reading observed in Pilot 1. Given this possibility, there will be a point during target processing, expectedly at the preposition *als* ('than') and thereafter, where the processor realizes the missing contextual fit and must trigger a re-analysis. If the assumption of an initially uninformed parsing is correct, a re-analysis should be more often required in case of the dispreferred structure, i.e., in the EXT/+MATCH-condition as compared to the INT/+MATCH-condition. The prediction derived from the occasional requirement of a re-analysis coincides with **Prediction I** – INT is easier to process than EXT – though for a different reason. On the structural complexity account, parsing more complex structures takes longer than parsing less complex structures, with the initiation of parsing being the same. On the re-analysis account, initiation of parsing a dispreferred structure is delayed, with parsing taking equally long. It is therefore possible that longer reading times are attributed to both a delayed initiation and a longer duration of the parsing process. Either way, I expect there to be a difference in reading times, supposedly on the standard of comparison and/or thereafter. The Figure 3.2 shows differences in reading times between the two readings.

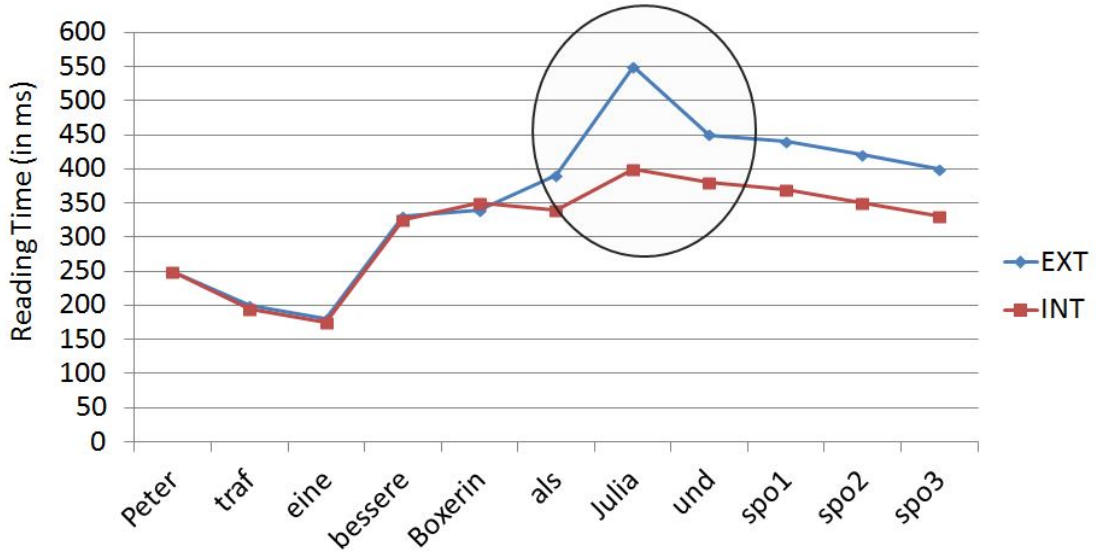


Figure 3.2: Expected Main Effect INT versus EXT (spo = spill over region)

In the graph, the sample sentence is "Peter traf eine bessere Boxerin als Julia und..." ('Peter met a better boxer than Julia and...') where 'spo' stands for the spill over region. The regions where I expect the difference in reading times are circled. I expect increased reading times at the preposition *als* ('than'), and the highest reading times at the standard of comparison 'Julia', i.e. RT(EXT) > RT(INT). This is where I predicted a significant difference between reading times of EXT vs. INT. At the spill over region, I expected gradually sloping reading times with EXT-condition still being at higher reading times during "recovery" after processing the standard.

Method

Materials: 20 of the 24 items of Pilot 2 were used in the RT study. There were two conditions, the internal reading INT/+MATCH, cf. (13-a), and the external reading EXT/+MATCH, cf. (13-b), either one paired with a matching context. The two variants of the experimental items were assigned to two lists such that half of the items was assigned in condition INT/+MATCH to List A and in condition EXT/+MATCH to List B; the other half of the items was assigned to the lists in a complementary fashion. 40 fillers were added to the 20 experimental items. 29 of all 60 items were equipped with a 'yes-no' comprehension question, 13 of which were correctly answered with "yes".

Participants and Procedure: 36 native German speakers, mostly students of the University of Tübingen, participated in the experiment; their age ranged from 20 to 62 years

with a mean of 26.9 years; 30 participants were female.

The experiment was conducted with E-Prime[9] in the labs of the Collaborative Research Center 833 at University of Tübingen. The experimental session was preceded by a short practice session to get familiar with the procedure. All trials began with a display showing the complete context. When participants were done reading the context, they pressed a continue button. By pressing the button, the context disappeared and the target sentence was presented completely masked: Letters and punctuation marks were substituted with underscores, blanks were visible as blanks. With the first pressing of the continue button, the first word became visible; with each subsequent button pressing, the currently visible word was re-masked and the following word became visible. With the last word of the sentence, pressing the button either finished the trial immediately or after answering a yes-no comprehension question; participants were given feedback about the correctness of their response.

Results and Discussion One participant delivered a wrong answer to 9 of 29 comprehension questions (31 % errors) and was excluded from the RT analyses. For the remaining 35 participants, the overall mean accuracy of responses to the yes-no comprehension questions was 89 % with a range from to 100 to 79 %. Reading times per participant per region deviating more than three standard deviations from the mean were classified as outliers and discarded from the analyses. Mean reading times per word are plotted in Figure 3.3, separately for the internal and the external reading.

[9]For information on this software see: `https://pstnet.com/products/e-prime/`

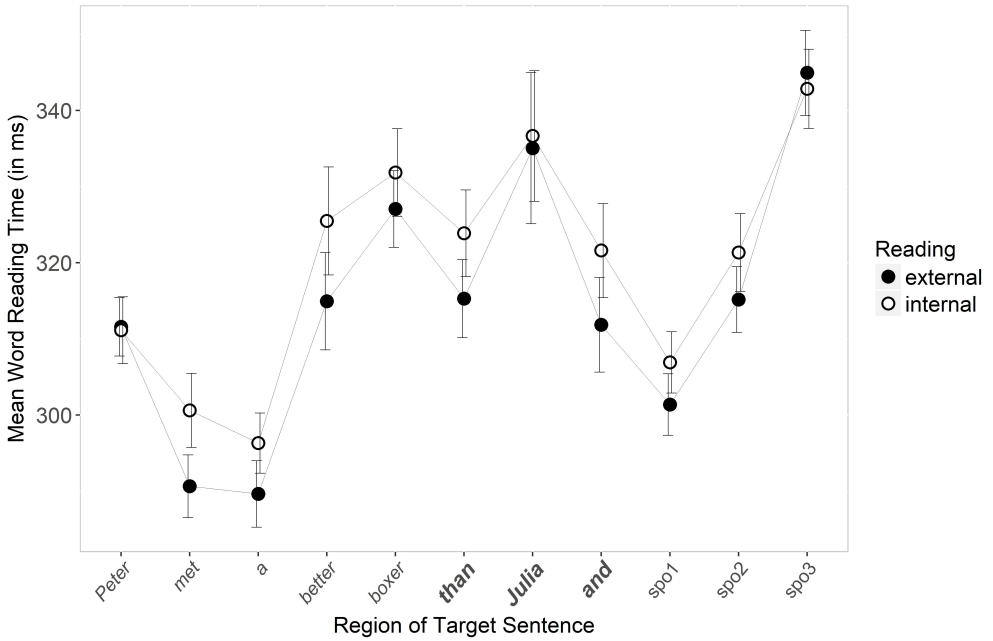


Figure 3.3: Reading times with INT versus EXT (spo = spill over region); error bars correspond to one standard error of the mean

Descriptively, INT is always slightly higher in reading times than EXT, against the expectation. However, taking into account the scale of the y-axis, it becomes clear that the differences are minimal, i.e. always under 10 ms. In fact, statistical analyses show that they are insignificant at any given region:

Main Effects	F(1,34)	Sig. (*p*-value)	Eta^2
REGION 7 = als	2,574	,118	,070
REGION 8 = Julia	< 1		
REGION 9 = und	1,810	,187	,051
REGION 10 = spo1	< 1		
REGION 11 = spo2	1,359	,252	,038
REGION 12 = spo3	< 1		

Figure 3.4: Statistics RT experiment

The p-values are not even close to being significant at any of the relevant regions. In other words, there are no significant main effects of reading type INT vs. EXT. and the expectation RT(EXT) > RT(INT) is not confirmed by the results.

How can we explain this? Why cannot we see any differences in processing of the internal versus the external reading? A post-hoc explanation could be that the participants can predict the structure that results from the contexts based on the disambiguating information. There are studies suggesting that in some cases the parser can make predictions of the material to come: for example, DeLong, Urbach & Kutas (2005) argue for the anticipation of specific words based on the English phonological peculiarity of the indefinite article ('a' vs. 'an' before consonants vs. vowels in nouns). They use event-related brain potentials to show that reader's brains can pre-activate upcoming words based on the article form. In our case, the predicted structure would have to be much bigger: a whole sentence would have to be predicted in advance based on the preceding context. If this is what happens, then by anticipating the upcoming structure, it is no longer necessary to parse the target sentence, i.e. to assign a structure to the input string because the structure has already been anticipated. That is why, upon reading the target sentence that follows the context, the parser does not experience any specific difficulty with respect to one or the other reading. If this happens often enough during the experiment, then it gets less and less probable to detect the predicted difference.

Another alternative post-hoc explanation, which seems even more promising, could be Priming. It might be the case that the preceding context primes material in the target sentence. For the external reading, suppose that the context primes "λx.Maria trifft $x\&boxer(x)$". This priming would then facilitate the external reading.

Irrespective of whether this alternative explanation is right or not, we must conclude that **Prediction I** is not borne out by this RT study. However, in addition to the effect of context, it could be the case that reading times are not fine enough of a method to detect any differences between the two readings. A finer measure is called for which is why the eye-tracking experiment was conducted subsequently, cf. section 3.4.

Interim Summary. Pilot 1 tested **Prediction II** and the RT study **Prediction I**. **Prediction I** stemming from the assumption that complexity of semantic representations is reflected in processing complexity stated that EXT should be more difficult to process than INT. **Prediction II** stated that the INT should also be preferred to EXT due to the influence of complexity differences on preference. Summarizing the results, Pilot 1, a forced-choice continuation study, detects an off-line preference for the internal reading thus verifying **Prediction II**. Pilot 2, an acceptability rating study, reveals no preference

when a preceding context precludes a direct competition between the two alternative readings. More specifically, both readings are rated to be acceptable to the same extent in appropriate contexts. A likely interpretation of the results is that the context is very powerful and can even overwrite the preference seen in Pilot 1. The self-paced RT study that was designed in order to specifically test **Prediction I** resulted in a null effect: There is no indication of processing difficulties for the external reading when compared to the internal reading. We conjecture that the effect of context is so strong that it suspends the semantic differences that we should have found in reading times, most probably because the contexts renders the structure of the matching reading highly predictable.

However, the world could have looked differently: when I developed the experiments, I thought that the role of context was different from what I just described. It could have been the case that the context would really have only disambiguated the sentences without having an influence on the ease of processing of the target sentence.

Taken together, these three experiments make an interesting contribution: Globally speaking, they make a contribution towards a better understanding of LF-parsing. There is one case in the syntactic parsing literature that seems to be working similarly as the one we investigated here: Carlson (2001) explores the processing of gapping structures like (14).

(14) *Bill took chips to the party and Susan to the game.*

a. Bill took chips to the party and ~~Bill took~~ Susan to the game.

b. Bill took chips to the party and Susan ~~took chips~~ to the game.

–Gapping Structure–

These structures are ambiguous between the 'non-gapping' reading in (14-a), where Bill took Susan to the game and a dispreferred 'gapping' reading in (14-b) where Susan took chips to the game. In her study, Carlson finds that sentences with greater parallelism between arguments receive more gapping responses, though an overall preference exists toward the nongapping structure. I.e., the simpler structure is preferred overall, even though parallelism plays a role in the interpretation.[10]

[10]Manfred Krifka comments that the reading a.) could also be preferred due to a different reason, namely the animate (*Susan*)/inanimate (*chips*)- contrast. According to Bryant (2006), there are differences in processing of these structures between children and adults. Children tend to intepret sentences like: "Hans gab Max ein Buch und Karl ein Bild" ('Hans gave Max a book and Karl a picture.') preferably as "...und Karl gab Max ein Bild." ('...and Karl gave Max a picture.'), i.e. the non-gapping response is given on trend. This might have consequences for the internal vs. external readings, where children might then prefer the external one. This is a route that might be worth

Hoeks, Redeker & Hendriks (2009), on the other hand, show with their off-line and on-line experiments that the effect of context and prosody is overwhelming: in the right combination they can make the dispreferred gapping reading as easy as the preferred one. Hence the parallel to our findings: without any context, we see a difference between a preferred and a dispreferred structure off-line. With context, even a highly dispreferred structure can get quite acceptable and any complexity effect can disappear thus resulting in a null effect in both off-line judgements (Pilot 2) and on-line processing (RT study). More work is needed in the investigation of the processing of comparative constructions, and more globally, of the role of context in such cases.

Also, as briefly mentioned before, the lack of any difference between the two readings in the RT experiment might be also at least partly due to the experimental methodology. It could be the case that reading times are not fine-grained enough of a method to detect any differences between the two readings. After all, the complexity differences are very subtle ones. Maybe reading times cannot detect them. A finer measure is called for: eye tracking is such a measure. I will now proceed to the eye-tracking experiment that was designed to test **Prediction I**.

3.4 Eye-Tracking Experiment

The eye-tracking experiment tested **Prediction I** with the help of the following structures[11].

(15) *Maria traf* [*einen besseren Boxer*] *als Peter...* (a) *...ein-er ist.* (b)
Maria met [a better boxer]-ACC. than Peter... ...a-NOM. is
...ein-en traf.
...a-ACC. met
'Maria met a better boxer than Peter... (a)... is. / (b)...met.'

These are the structures that were used in Pilot 1. Since a preference for INT was detected off-line, it looked promising to test exactly these structures on-line. With eye tracking, fine-grained processing measures can be obtained for potentially subtle effects like the one we are interested in. I will first discuss the semantic analysis of these structures in more detail before moving on to the experiment.

while testing in future research.

[11] The eye-tracking experiment was done in collaboration with Fabian Schlotterbeck and Oliver Bott.

3.4.1 Structure of Comparatives with the Continuations

In this subsection I show the structure of the constructions with the continuations "einer ist". As already pointed out before, the standard of comparison is nominative-marked under both readings INT and EXT when followed by the two continuations. This is different in sentences without the continuation where the standard is either nominative-marked, in which case we get EXT, or accusative-marked, in which case we get INT[12]. Compare (16) with continuations to (17) without.

(16) a. *Maria traf* [*einen besseren Boxer*] *als* **(*der*)** ***Peter***
Maria met [a better boxer](ACC.) than (the(NOM.)) Peter(NOM.)
ein-er ist.
a-NOM. is
'Maria met a better boxer than Peter is.' INT

b. *Maria traf* [*einen besseren Boxer*] *als* **(*der*)** ***Peter***
Maria met [a better boxer](ACC.) than (the(NOM.)) Peter(NOM.)
ein-en traf.
a-ACC. met
'Maria met a better boxer than Peter met.' EXT

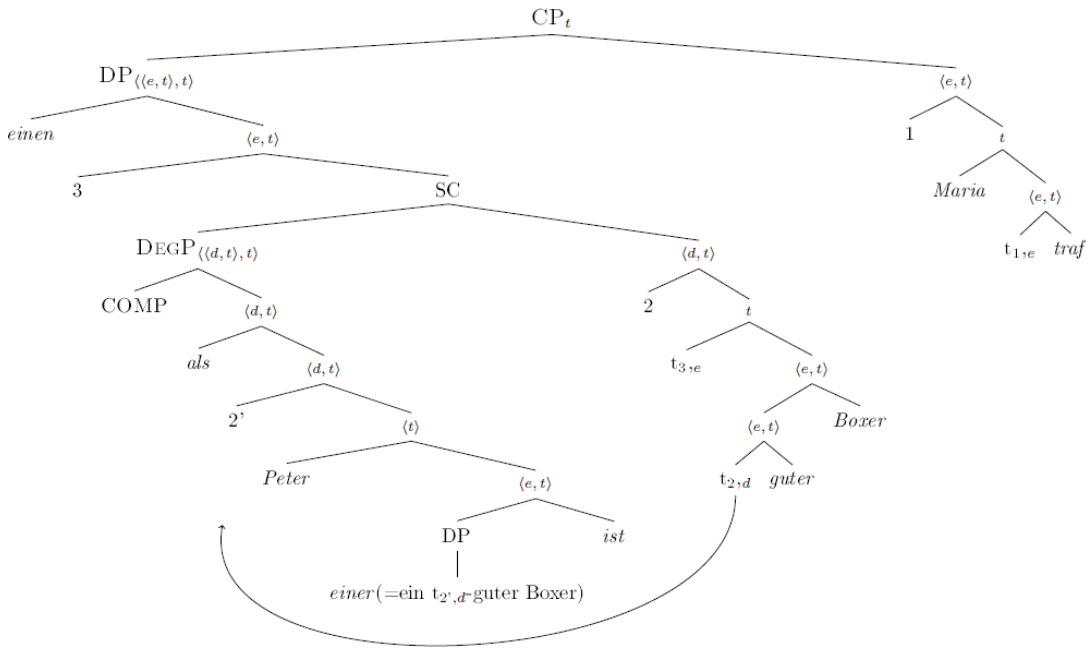
(17) a. *Maria traf* [*einen besseren Boxer*] *als* **(*den*)** ***Peter***.
Maria met [a better boxer](ACC.) than (the(ACC.)) Peter(ACC.)
'Maria met a better boxer than Peter is.' INT

b. *Maria traf* [*einen besseren Boxer*] *als* **(*der*)** ***Peter***.
Maria met [a better boxer](ACC.) than (the(NOM.)) Peter(NOM.)
'Maria met a better boxer than Peter met.' EXT

While 'Peter' in (17) can be case-marked by the accusative ('den Peter') to yield INT, or the nominative ('der Peter') to yield EXT, the standard 'Peter' in (16) is nominative-marked under both continuations. The question is then, whether the sentences with the continuations have a different structure altogether. I propose the following two LFs for the structures with the continuations.

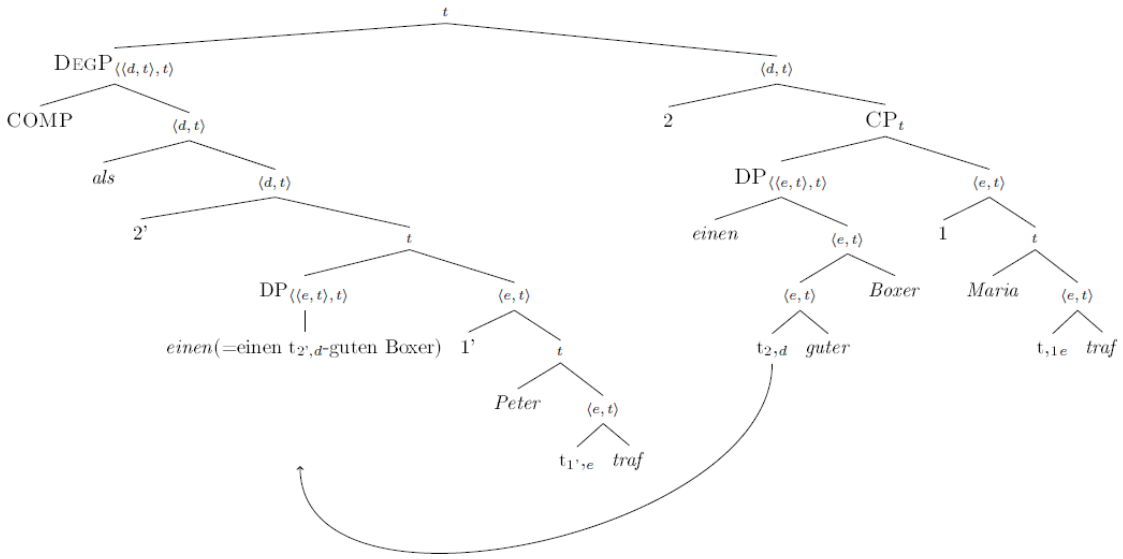
[12] I am grateful to Manfred Krifka (p.c.) for bringing this up, cf. also the footnote in 6, on p. 90, this chapter

(18) LF for the example with the continuation: "...einer ist."



When we now compare the LF in (18) to its sibling (5) (that also can be found in Appendix A), we detect only minimal differences that particularly concern the structural/representational status of the material after the standard. For instance, there is no pronounced material after the standard in (5), the material we see there is provided by ellipsis. In (18), on the other hand, there is pronounced material, namely *einer ist* after the standard 'Peter'. Structurally, while there is no verb *is* ('is') in (5), there is one in (18). We resolve the anaphoric 'einer' by the term 'ein *d*-guter Boxer' ('a *d*-good boxer'). The resulting truth conditions, however, do not differ.

(19) LF for the example with the continuation: "...einen traf."



Comparing the LF in (19) to (6), there are again small differences due to the status of the material after the standard. The anaphoric expression *einen* and the verb *traf* are of course both pronounced material in the case with the overt continuation, while in (6), the expression "a *d*-good boxer" is provided by syntactic ellipsis according to the clausal analysis. The pro-form *einen* in (19) can be resolved by 'einen *d*-guten Boxer' ('a *d*-good boxer'). It is raised to the next truth-value denoting category since it is treated as an existential quantifier. It creates the abstractor $1'$ and leaves the trace $t_{1',e}$. The same happens in (6), but covertly. Again, the final outcome is truth-conditionally the same. The whole true difference seems to be that the ellipsis is smaller in (19) than in (6).

The important differences that may matter for processing are (i) the size of the QR of the DegP and (ii) the overall size of the tree. These are subject to the same differences whether the continuations are there or not. Hence, for the sake of my experiment, the differences between the two sets of structures are negligible. Besides, if we assume that the parser processes the structure incrementally, the disambiguating continuations will be hit after reading the standard of comparison, i.e. in our case a proper name. This means that until the standard of comparison the structures should be processed absolutely identically anyways.

After having addressed the structure of the disambiguating continuations, I will now report on the eye-tracking experiment.

3.4.2 Eye-Tracking Experiment

As already mentioned above, eye tracking during reading allows us to gain fine-grained processing measures for potentially subtle effects. The following Figure 3.5[13] illustrates the central measures that can be taken for eye-tracking.

Figure 3.5: Eye-tracking Experiment Possible Measures

The light red dots with the numbers above and below them represent the landing sites of our gaze on a certain point (fixate), the numbers represent the order in which the gaze is going. According to Frazier & Rayner (1982), fixations are defined as the time spent focused on a given location. The eye is picking up perceptual information (for roughly 6 characters in the fovea and up to a dozen in the periphery). A regression is an eye movement back to already fixated portions of the text. First pass time is the time spent on a region not including regressions. Total time is the total fixations of all the fixations in the region. As to regression path duration: an example are fixations with numbers 4,5,6, and 7 taken together. This is an important measure in our experiment, as the reader will see in the results section.

Design

We employed a 2 × 2 factorial design where we manipulated the case (nominative vs. accusative) and the type of structure (comparatives vs. relative clause) of the test sentences.

For the experiment, we followed what we call the "garden path" (c.f. Frazier 1987)–recipe: A local ambiguity arises once the parser hits the standard of comparison. There is one preferred reading, namely the internal reading, according to results of Pilot 1, and a subsequent disambiguation effect. We opted for an interaction design with two target and two control conditions. The reason for an interaction design was that if a difference is detected between the two disambiguated sentences and there are no control conditions, the difference might be due to all kinds of factors, for instance differences in processing of nominative vs. accusative case or the higher frequency of *ist* ('is') vs. the main verb due

[13]Source: `https://proswrite.com/2013/06/29/want-satisfied-workplace-readers/`

to which the *einer ist*-continuation might be preferred. And if the effect can be traced back to other factors even with the control conditions, they still provide information about which factors might play a role. Since the control conditions were constructed so as to be maximally similar to the comparison constructions, the detected difference is likely to be due to the comparison construction itself and not any of the other factors. Here is an example item including both target in (20) and the control conditions in (21). The whole sample of sentences used in the experiment can be found in appendix C.1.

(20) **target conditions**

a. *Fabian befragte [einen lustigeren Berater] als| Leon|$_{\#1}$ einer ist.|$_{\#2}$*
Fabian questioned [a funnier consultant]-ACC. than Leon a-NOM. is
'Fabian questioned a consultant who is funnier than Leon.'

b. *Fabian befragte [einen lustigeren Berater] als| Leon|$_{\#1}$ einen befragte.|$_{\#2}$*
Fabian questioned [a funnier consultant]-ACC. than Leon a-ACC. questioned
'Fabian questioned a consultant who is funnier than any consultant that Leon questioned.'

To control for lexical, morphological and syntactic differences between these two conditions, they were compared to sentences like the following **control conditions**:

(21) *Fabian befragte [einen lustigen Berater] und erzählte es sogleich Leon, der| auch|$_{\#1}$* (a) *einer ist.|$_{\#2}$* (b) *einen befragte.|$_{\#2}$*
Fabian questioned [a funny consultant]-ACC and told it immediately Leon who also (a) a-NOM is (b) a-ACC questioned
'Fabian questioned a funny consultant and presently told it to Leon who (a) is one, too. (b) questioned one, too.'

All four sentence conditions were continued by the same spill-over regions, as in (22). The spill-over regions were included to control for sentence wrap-up effects and to detect effects of later processing of the continuations, as was also done in Pilot 2 and the RT-experiment.

(22) a. *Fabians|$_{\#3}$ Berater hatte einen sehr guten Sinn für Humor.*
Fabian's consultant had a very good sense of humor
'Fabian's consultant had a very good sense of humor. '

Here is my explanation why the controls are maximally similar to the targets: The control conditions contain a relative clause, "der (auch) einen befragte" . Relative clauses are

analyzed by *wh*-movement:

(23) [$_{CP}$ [*der* [1 [$_{C'}$ Ø[$_{VP}$ t_1 ...]]]]]

Thus, the structure is maximally similar to the comparative target in that it contains a *wh*-movement. This is also the case in the standard clause of comparatives "...als Peter."

(24) [$_{CP}$ *als* [*wie* [1 [$_{C'}$ Ø[$_{iP}$ *Peter* t_1 *groß ist* ...]]]]]

Remember that this is just the Reduction Analysis discussed in section 2.1.1 for English in example (2-a) repeated in (25-a):

(25) a. LF: *Jenny is taller* [$_{PP}$ *than* [$_{CP}$ [how [1 *Sophia is* t_1*-tall*]]]]

So, the only structural difference between the comparative targets and the controls is really only the comparative that requires abstraction over degrees. That makes the controls very suitable.

Additional similarity between the target and control items are the introduced discourse referents: In the case of the nominative continuation, there are three discourse referents both in the target and the control, namely Fabian, Leon and a third unknown funny consultant. In the case of the accusative continuation, there are four discourse referents in both target and control conditions, namely Fabian, Leon and two unknown consultants Fabian and Leon questioned. This makes the targets and the controls pragmatically similar, as well.

The recipe for the interaction design is thus the following: based on **Prediction I**, the expectation is that (20-a) has a simpler analysis than (20-b) and is thus easier to process. The important part is played by the control conditions: here, it is expected that (21-a) is easier to process than (21-b), but the difference between (20-a) and (20-b) is bigger than between (21-a) and (21-b).

The crucial regions of interest (ROIs) are ROI # 5, the "preview" region, ROI # 6, the "critical" region and ROI # 3 and the "spill-over" region:

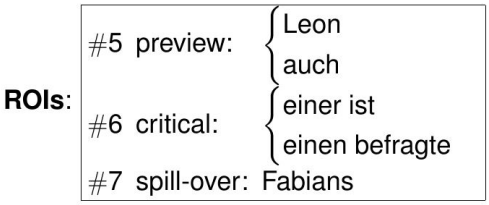


Figure 3.6: Eye-tracking Experiment - Central Regions of Interest (ROIs)

Again, this is a 2×2 factorial design with the factor **case**: NOM. vs. ACC. ($\equiv$ INT. vs. EXT. in the target conditions). And the factor **construction**: comparative vs. control.

Based on **Prediction I**, we expect a higher processsing cost for (20-b) vs. (20-a) on the critical (=disambiguating) region "einer ist" vs. "einen kennt". The expected interaction is a larger effect of case within comparative vs. control condition. A possible shape for the predicted interaction is shown in Figure 3.7.

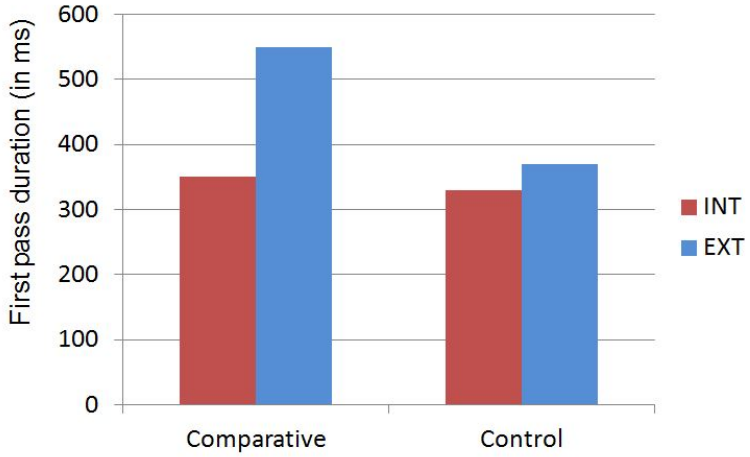


Figure 3.7: Eye-tracking Experiment - Predicted Interaction

As a possible measure for the y-axis, I am using first pass time for the sake of illustration in Figure 3.7. Before starting the experiment, we were not completely sure in which measure exactly we would find the interaction. Plausibly, however, it was expected to be found in first pass time, and also regression path duration. For first pass time, we would expect longer fixations on the standard of comparison, ROI# 5 for both target conditions. And significantly higher fixations for the critical ROI# 5 for EXT than for INT and a smaller contrast in fixations for the control conditions causing the interaction.

More regressions were expected for for EXT vs. INT in comparison to NOM. vs. ACC. in the control condition on ROI# 6 and thereafter, because the gaze should be going back to resolve the ambiguity.

Method

Materials: 24 items like the example above were tested. These were distributed across 4 lists with the help of a Latin Square Design. That means that each subject saw all of the 24 items, but probably in different conditions depending on the list. The experiment had a total of 184 trials: of which 24 were the experimental items and 160 fillers. Comprehension questions were posed for 12 of 24 of the experimental items. For the fillers, there were 52 yes/no comprehension questions and 40 verification tasks[14].

Participants and Procedure: 32 subjects who were mostly students of the University of Tübingen, participated in the experiment. The experiment took approximately one hour in total.

The experiment was programmed with the help of EyeLink Software by SR research[15], sampling rate: 1000 Hz. It was conducted on an Eyelink 1000 Eyetracker.

Results and Discussion

We computed descriptive statistics and generated plots to obtain an overview of the reading behavior of our participants. We analyzed first fixation duration, first pass time, second pass time, total time, first pass regression ratios, regression path duration, selective regression path and rereading duration. However, only in the first pass regression ratios did we find a significant interaction that was predicted. Significant main effects were found in first pass time. There was also an automated cleaning procedure that eliminates or merges too short fixations. The cleaning procedure affected 12,2% of all fixations for my target and control conditions. I will only report on the statistically significant main effects and the interaction. The interested reader is welcome to consult the appendix C.2 for the statistics of all the measures we have looked at with bar plots for the whole sentence and the three interesting ROIs # 5, # 6 and # 7, for each of the measure that was analyzed, respectively.

The statistical analysis was conducted with the help of R and GLMMs (generalized linear mixed models) using the lme4 package (cf. Bates et al. 2015). Since the α error

[14] The reason for this is that my experiment was integrated as a sub-experiment in a bigger experiment which also contained a sub-experiment on scope and negation by Fabian Schlotterbeck and Oliver Bott.

[15] Cf. `https://www.sr-research.com/experiment-builder/`

(type I error) reflected by the p-value increases the more statistics are calculated, the α-level was Bonferroni corrected to a value of .004 (cf. von der Malsburg & Angele 2017). **Main Effects**. I will only report on main effects that fall under the Boferroni corrected value of .004. This will be the first pass time and the first pass regression ratios. The first pass time for the whole sentence is shown in Figure 3.8.

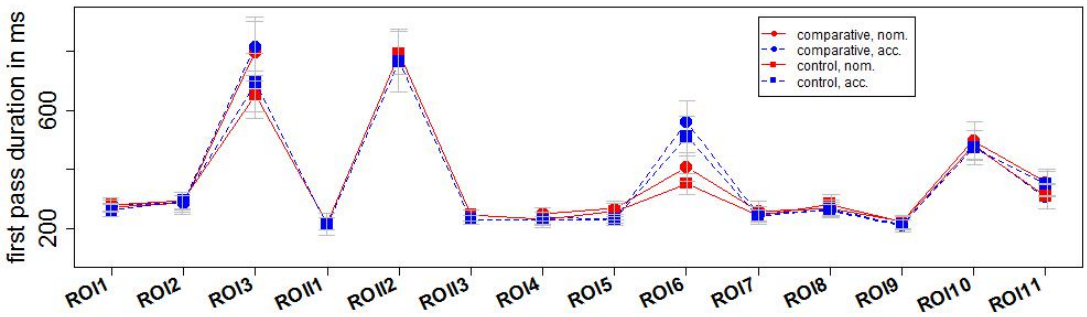


Figure 3.8: First Pass Time

This is the graph for all of the regions, i.e. the whole sentence for the first pass time. Upon visual inspection already, it can be seen that ROI # 5, # 6 and # 7 are the ones where the action is happening. Zooming in on the relevant regions, that is the picture we get:

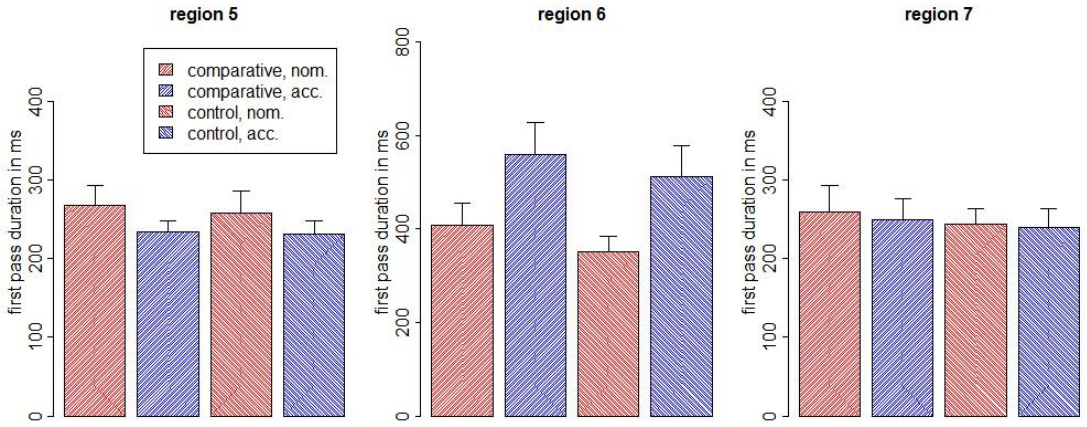


Figure 3.9: First Pass Time Individual ROIs

We see a main effect of case: NOM. < ACC. $p = .0002$ (i.e. $p < .004$). The accusative marked continuations are significantly slower than the nominative-marked continuation on the critical (disambiguating) ROI # 6 in first pass time. We also see a main effect of construction: control < comp. ($p = .004$). That means that the comparative takes significantly longer in this measure than in the controls. However, we do not see the predicted interaction. Still, this main effect is compatible with easier processing of INT compared to EXT.

Interaction. In fact, the only significant interaction that we find is in a very specific measure, namely first-pass regression ratios. Again, let us first look at the plot for the whole sentence and then at the bar plot for ROI # 5, # 6 and # 7.

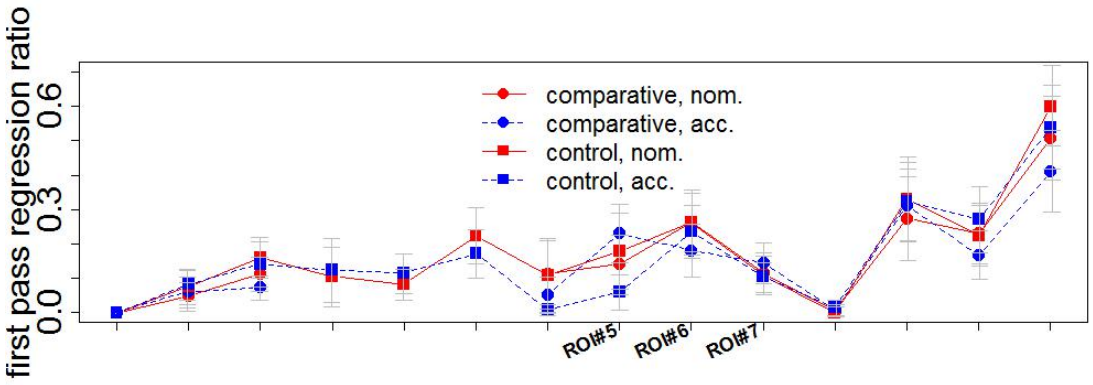


Figure 3.10: First Pass Regression Ratios

Note that in this measure, the y-axis describes the ratios and not the times in ms. Again, non-matching ratios start shortly before ROI # 5.

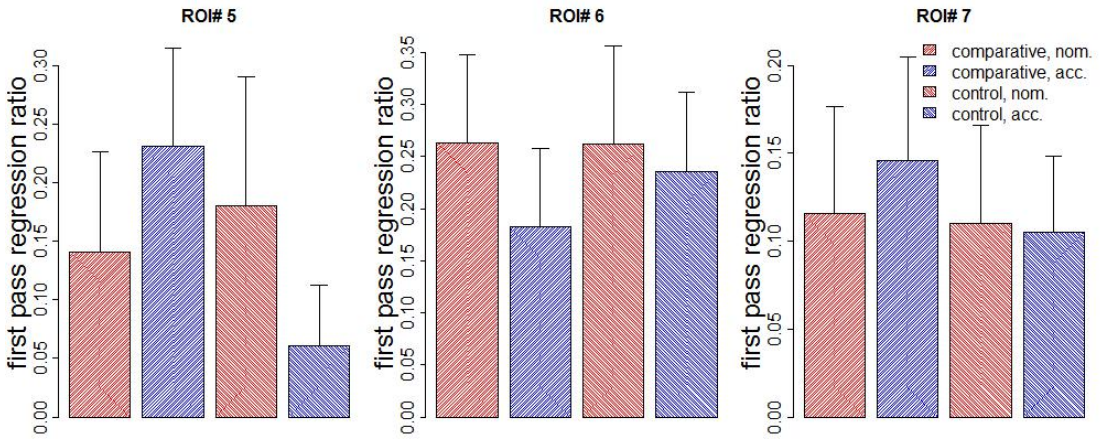


Figure 3.11: First Pass Regression Ratios Individual ROIs

In the preview region, ROI#5, the interaction turned out to be statistically significant ($p = .003$).

However, how is this possible? Although the participants are seeing the same word, namely 'Leon' in the example sentence in (20), which is the standard of comparison, they go back with their gaze significantly more often when it is followed by "einen Ved" (where V stands for a lexical verb) than when it is followed by "einer ist". I want to argue that this is possible due to parafoveal pickup (cf. Rayner 1998). The parafoveal vision allows to process information that follows the word immediately to the right of the fixated word. That means that the person reading the standard of comparison can already see the continuation. The accusative-marked continuation then triggers more regressions than the nominative-marked continuation. This means that resolving the ambiguity for EXT is more costly than for INT. This also means that at the standard of comparison, the pending EXT triggers more eye regressions than INT . This might also speak in favor of the preposition *als* being the trigger for comparative interpretation, where the resolution of the ellipsis has to take place. An idea for a follow-up experiment that is worth while pursuing is to eliminate the possibility of a preview by conducting a reading time-experiment with a moving window design with the same constructions and the same continuations. This would eliminate the possibility of a preview. An idea for a follow-up experiment that is worth while pursuing is to eliminate the possibility of a preview by conducting a reading time-experiment with a moving-window design with the same constructions and the same continuations. Plans for a future experiment will be discussed in more detail in section 3.5.1.

Interim Summary. Despite the fact that we don't find the predicted interaction in measures like first pass time, the preview effect in first pass regression ratios just described point to the same direction as Pilot 1 thus providing some evidence for **Prediction I**. The eye-tracking experiment adds on-line data that support the prediction. In line with our prediction, comparatives with accusative case (EXT) led to more first-pass regressions than comparatives with nominative case (INT) whereas the opposite pattern is observed in the control conditions. However, the results have to be taken with a grain of salt: The only significant interaction was found in first-pass regression ratios in the preview region, ROI#5 ($p = .003$). Whether or not this really can be explained by semantic complexity differences (longer movement in QR) should be investigated in future studies, since we cannot speak of a total confirmation of the predictions which expect a higher processing cost for EXT.

3.5 Chapter Summary

In this chapter, I investigated structural differences between two readings of ambiguous attributive comparatives in German. I derived **Prediction I** and **Prediction II** about the processing and preference of these constructions. These predictions were then tested in two pilot studies, one RT study and one eye-tracking experiment. **Prediction I** stemming from the assumption that complexity of semantic representations is reflected in processing complexity states that EXT should be more difficult to process than INT. **Prediction II** states that the internal reading should also be preferred to the external one due to the influence of complexity differences on preference.

The more global enterprise of testing predictions from the standard degree theory mentioned in the introduction has at least started to take shape: we know now what to look out for in further empirical investigations and what to expect when working with disambiguating contexts. The role of preceding context turned out to be too strong so that the RT experiment yielded a null result. The eye-tracking experiment with its preview effect in first pass regression ratios showed that we are on the right track: EXT requires more regressions than INT. This effect must be due to the difference in processing complexity of EXT vs. INT, otherwise it is hard to explain the interaction we found in regression ratios! The unexpected finding is that the effect of semantic complexity on eye movements shows up extremely early and is extremely local. Still, our results indicate that complexity of compositional semantic representations affects how comparatives are processed thus supporting **H2**. The more complex EXT is dispreferred off-line; and upon disambiguation it leads to disruption during reading.

Methodologically, eye tracking proved to be a relevant measure for the processing of these comparatives.

Respective future research: A question I have not addressed here, but that should be addressed in future research on these constructions is the role of ellipsis. Quite apparently, as we can see in the LFs (5) and (6), big chunks of the structure stay unpronounced. How exactly does the ellipsis in INT vs. EXT look like? Presumably, the ellipsis in EXT will involve the ellipsis of a full VP, while ellipsis in INT will only involve eliding a small clause without a full verb. Would this add a factor in the increased complexity of EXT vs. INT? Considering the eye-tracking experiment, one might ask whether the full semantic interpretation is plausible when ROI#5 is fixated and the disambiguating case marking is merely in preview.

3.5.1 Future Experiments

A plausible next step is an RT experiment where the ambiguous sentences are presented without context and either with the continuations "...einer ist" and "einen V3.SG[16]", or disambiguated instead via case marking.
(i) The results from experiments illustrated in this thesis should be extended and corroborated by further experiments. The next plausible step in checking whether EXT is really more costly in processing than INT in German, is to conduct a RT experiment without preceding contexts. To avoid the problem with the continuations like "...einer ist/...einen Ved" and of preceding contexts, the disambiguation should be carried out via case marking, cf. (26).

(26) a. *Peter fing* [*eine flott-er-e* *Biene*] *als* ***den*** ***Alex.***
Peter caught [a(F.) brisk-COMP.-F. bee]-ACC. than the(ACC.) Alex(ACC.)
'Peter caught a more brisky bee than Alex is.' –ONLY INT–
→ Alex is a bee under this reading.

b. *Peter fing* [*eine flott-er-e* *Biene*] *als* ***der***
Peter caught [a(F.) brisk-COMP.-F. bee]-ACC. than the(NOM.)
Alex.
Alex(NOM.)
'Peter caught a more brisky bee than Alex caught.' –ONLY EXT–

Using these sentences will avoid the problem of context influencing the results in any way. By using a moving-window technique, the possibility for a preview effect that we found in

[16]This stands for: verb in the 3rd person singular.

eye tracking will also be avoided. There we expect to see the effect of EXT being costlier than INT on the article *der/den* and the standard (and likely also at further spill-over).

I also would like to explore a cross-linguistic perspective by looking at Russian. In Russian, the same ambiguity exists for the clausal attributive comparison in (27-b). However in (27-a), where the standard of comparison is phrasal, only INT is available.

(27) a. *Masha znaet boksyor-a lučše Peti.*
Masha knows boxer-ACC. better Petya-GEN.
'Masha knows a better boxer than Petya.' –**only INT**–

b. *Masha znaet lučše boksyor-a čem Petya.*
Masha knows better boxer-ACC. what-INSTR. Petya
'Masha knows a better boxer than Petya. ' –**EXT & INT**–

Remember that for German EXT should be more difficult than INT in processing for German. The cross-linguistic prediction is that for Russian, the pattern should be reversed for ambiguous *čem*-clauses. According to Gricean reasoning, since a simpler structure is available to express INT, namely the genitive-marked one in (27-a), we expect INT in Russian to be harder than EXT in comparatives with clausal *čem*-standards as in (27-b). If this pragmatic reasoning applies to the case at hand, the despite the fact that semantically, (27-b) receives the exact same analysis as the German pendant, the pattern will be reversed.

I hope to have convinced the reader that this kind of enterprise is worthwhile and brings to light insights about the interactions of semantic theory and processing.

Chapter 4

Variation in the Differential Argument: Fieldwork

To remind the reader of the goals of the present chapter, I will start by repeating the research questions and the hypothesis put forward in the introduction below.
The research questions **Q3a-Q3c** are repeated in (1).

(1) **Q3**: What is the semantics of comparison constructions in Nenets (Ch. 4)? In particular:

a. How are comparative constructions best analyzed in Nenets?
b. What is the role of the differential argument?
c. How can degree (predicate) modification be integrated into the analysis?

The hypothesis **H3**, does not specifically refer to one or the other research question, but ties them to the analysis that uses the differential degree slot in Nenets comparatives and takes a stance on how degree predicate modification works in Nenets. I repeat the **H3** in (2) below.

(2) **H3**: Degree predicate modification in Nenets comparatives provides evidence for Degree Restriction in natural language (similar to Event Identification by Kratzer 1996 and Restrict by Chung & Ladusaw 2004).

The need for this new composition principle opens new routes of research. It is not only that this new rule solves an immediate composition problem. I believe that the grammatical generalizations that motivate it are of interest for future research on incorporation in different languages across different semantic domains (the domain of individuals, events,

but also degrees). I will elaborate on this in the subsection 4.3.5.1.

This chapter is a detailed study of comparatives in Nenets and their semantic analysis. I consider it the most innovative of this dissertation both theoretically and empirically, since it contains new original research data and new analyses that not only challenge claims from descriptive literature on the status of the suffix *-rka*, but also provide evidence for an analysis that uses a formal semantic operation only known so far from other domains, for instance the domain of individuals (RESTRICTION for noun incorporation by Chung & Ladusaw 2004) and the domain of events (EVENT IDENTIFICATION (EI) by Kratzer 2002). This is a type of conjunction of higher-type functions with lower-type functions. My evidence speaks in favor of DEGREE RESTRICTION thus extending Chung and Ladusaw's and Kratzer's operation to the domain of degrees. This makes this type of operation a generally available mechanism in different domains of grammar.

A challenge that I will also address is a problem that concerns differential comparatives which seem to be a deal breaker for theories that work without degrees (e.g. Klein 1980, Klein 1991 etc.), but also theories that do work with degrees in the semantic ontology. Since my analysis will need to implement the fact that Nenets *-rka* has to modify the differential degree, even though, morphologically, it is located on the gradable predicate, I will briefly address a general problem of differentials, i.e. that in English, for instance, they need to take scope above the standard constituent to yield correct truth conditions (cf. Alrenga & Kennedy 2014, and also Beck 2012 for *exactly*-differentials).

This chapter is structured as follows: I will start by illustrating the two central puzzles in section 4.1. Then, I will proceed to an analysis of comparatives in Nenets without the suffix *-rka* in section 4.2. In this subsection, I will also provide more information on how degree constructions work in Nenets by addressing the parameter setting from Beck et al. 2009 (for details consult section 1.3.2.1 in the introduction). Subsequently, in section 4.3, I will provide an analysis of Nenets comparatives containing the suffix *-rka*. Here we will see an analysis that works with the differential degree of the comparative. Then, two outlooks will be provided. Outlook 1 will present exciting Nenets data that shows that *-rka* can appear outside of comparison and that it is syntactically cross-categorial. I will provide parallels to other *-rka*-like elements cross-linguistically in Outlook 2 (cf. section 4.5). The fourth chapter is concluded with a summary in section 4.6.

4.1 Two Puzzles in Nenets Degree Constructions

Before I present the analysis for comparatives without *-rka* and subsequently with the suffix *-rka*, I will first lay out the puzzles that we find in Nenets comparison constructions.

Puzzle 1: The Semantics of the Unmarked Form. The morphologically unmarked form of the adjective in Nenets can be used in a sentence with a positive meaning as in (3), as well as in sentences expressing a comparison as in (4), where we compare two individuals along a scale. Example (5) is a case of a contextual comparative construction (without the explicit standard of comparison mentioned).

(3) *Petya pirc'a.*
Petya tall
'Petya is tall.'

(4) *Katya Masha-xad pirc'a.*
Katya Masha-ABL. tall
'Katya is taller than Masha.'

(5) The context: Katya's height is 1.70m. Masha's height is 1.65m.

a. *Katya pirc'a-(rka).*
Katya tall-(RKA)
'Katya is taller.'

—Contextual Comparative (ConC)—

In a crisp judgment context (cf. Kennedy 2007), where there is only a minimal difference in the heights of the girls and where it is established that both girls are small, i.e. where Katya's height is 1.52m and Masha's height is 1.50m, two speakers still accepted (5) without *-rka*. Is the unmarked form of the adjective carrying the comparative meaning already? Oda (2008) proposes in her dissertation the following lexical entry for Japanese gradable adjectives.

(6) Japanese type: $[\![A]\!] = \lambda d'.\lambda x.\text{MAX}(\lambda d.A(d)(x)) = c + d'$ where c stands for c = contextually given standard degree[1] (Oda 2008: 75)

According to this, Japanese gradable adjectives carry a comparative meaning, where the comparison is with c. What speaks against this in Nenets is that in these contextual

[1] A stands for any given adjective. In my notation, it would be R (for **r**elation provided by the adjective).

cases most speakers prefer to keep the suffix *-rka* on the gradable predicate. This is intriguing. As I will show in section 4.3, in cases like (4) with an explicit standard of comparison, the suffix is appropriate if the difference in the provided gradable property is small between the two individuals, i.e. if they are not far away from each other on the scale provided by the gradable predicate. The question then remains what the semantics of the gradable predicate in Nenets is. I will claim that in cases with an explicit standard of comparison, the adjective just has the normal relational lexical entry we have already seen. The interesting case remains the contextual comparative which will be discussed in more detail in section 4.3.4.

Puzzle 2: The Semantics of *-rka* Example (7) shows a comparison between two individuals with *-rka* present on the adjective.

(7) *Katya Masha-xad pirc'a-rka.*
Katya Masha-ABL. tall-RKA
'Katya is a little taller than Masha.'

My fieldwork data clearly suggest that in comparisons *-rka* is used if there is a small difference between the associate and the standard of comparison. That means that *-rka* in these cases, i.e. cases with an explicit standard, is not the comparative marker. This means that there is **no overt comparative marking on the adjective**, and *-rka* is a different creature, namely the modifier of a differential degree that is per default present in all comparative constructions. I will discuss my analysis in detail in section 4.3.

4.2 Analysis of Nenets Comparatives without *-rka*

As far as I can see, no systematic description or analysis of Nenets comparison constructions exists so far. Language-specific grammars such as Décsy (1966), Terezhenko (1947) and Nikolaeva (2014), among others, provide grammatical information on different aspects of comparison constructions. However, a detailed and complete account is missing. This thesis will fill this gap.

In an older grammar by Castrén (1854), he reports that originally, any kinds of comparison degrees («Comparationsgrade», p. 187) were missing in Yurak Samoyed:

> Comparationsgrade fehlen ursprünglich in allen Sprachen Finnischer und Tatarischer Abstammung. Einige unter ihnen haben jedoch nach und nach sowohl einen Comparativ als Superlativ entwickelt, während andere keine

> besonderen Formen für diese Grade haben. Unter den Samojedischen Sprachen bildet keine einzige regelmässige Comparationsgrade, sondern diese werden hier wie in den meisten Finnischen und Tatarischen Sprachen theils durch einen **Casus**, theils durch **Partikeln**, theils auch durch **Deminutivformen der Adjektive** ausgedrückt.[2] (Castrén 1854,1966: 187-188)

For "Casus" Castrén must have in mind the ablative marking on the standard of comparison that we also find in Present Day Nenets (PDN). By "Partikeln" he might have had in mind expressions like *piruwna* ('compared to') (cf. Beck, Oda & Sugisaki 2004; Hohaus 2015 for an account of this type of expressions). The interesting part are the "deminuitive forms of the adjectives". By this, he seems to refer to the suffix *-rka* that will be the main topic of section 4.3. The question is how to interpret the term "Comparationsgrade" that Castrén uses. Judging from the whole quote, he believes that Nenets doesn't have the strategy of building comparatives and superlatives morphologically by using dedicated morphemes like e.g., many Indo-European languages (the German and English *-er*). It is therefore important to determine what we mean when we talk about a language being able to integrate degrees into the grammar.

4.2.1 Parameter Setting in Nenets[3]

In this section, I will show that Nenets has the parameter setting [+DSP], [+DAP], [-DEGPP] by applying the diagnostics from Beck et al. (2009). I will provide original fieldwork data that show that Nenets (i) has degrees in the grammar of adjectives (i.e. [+DSP]), (ii) has abstraction over degrees (i.e. [+DAP]) and (iii) the Spec,AP position cannot be overtly filled in Nenets (i.e. [-DEGPP]).

4.2.1.1 Degree Semantics Parameter (DSP).

I illustrated in section 1.3.2.1 what it means for a language to integrate degrees into the grammar of adjectives, i.e. to have gradable adjectives of the type in (8).

[2] English translation: "Comparative degrees are absent from all languages of Finnish and Tartar origin. However, some amongst them have gradually developed both a comparative and a superlative, others don't have any special forms for these degrees. Among the Samoyedic languages, there is not a single one that forms regular comparison degrees, they rather mark these as in most Finnish and Tartar languages partly by a case, partly by particles, partly also by deminuitive forms of the adjectives."

[3] This section overlaps with Berezovskaya (2019) which was written to be suitable for a general audience. I provide a more worked out and formal version here.

(8) $[\![tall]\!] = \lambda d.\lambda x.\text{HEIGHT}(x) \geq d$

This predicate takes an individual and maps it to a degree on the height scale. Crucially, it also introduces the degree slot. Remember that Differential Comparatives (DiffC) and Comparison to a Degree (CompDeg) are good diagnostics for degrees in a given grammar of a language. Not all languages do integrate degrees into the semantics, i.e. Motu (Beck et al. 2009) and Washo (R. Bochnak 2013). In PDN there are CompDegs as in (9) and DiffCs as in (10).

(9) *Polka* [*sidnd'et juh santimetr-xad*] *jamb.*
Shelf eight ten centimeter-ABL. long
'The shelf is longer than 80 cm.'

—Comparison with a Degree (CompDeg)—

(10) *Katya Masha-xad saml'aŋg santimetra-nh pirc'a(-rka).*
Katya Masha-ABL. five cm-DAT. tall-(RKA)
'Katya is 5 cm taller than Masha.'

—Difference Comparison (DiffC)—

These examples clearly show that there is a reference to degrees in contemporary Nenets grammar despite the fact that there is no morphological reflex on the gradable adjective. This lack of a morphological reflex is not surprising from a cross-linguistic point of view. There are many languages that incorporate degrees in this way, like Turkish (Hofstetter 2009) or Samoan[4] (Hohaus 2010, Hohaus 2012, Hohaus 2015), among others. In any case, the diagnostics in (9) and (10) show that PDN has the positive setting of the [Dsp]-parameter.

4.2.1.2 Degree Abstraction Parameter (DAP).

I will first discuss scope ambiguities and then the negative island effect in Nenets in order to establish the parameter setting of Dap.

[4]However, here morphological marking of the comparative is optional.

Scope Ambiguities: As I have established in section 2.3.2.1, Nenets lacks clausal standards. Also, as discussed in section 2.2.2 for Russian, testing ambiguities like the one in (12-a) is enough for Nenets, since in Nenets there is only Heim's phrasal operator, i.e. we are not concerned with possible confounders (like differences in ellipsis site), when we are faced with a scope ambiguity. But first, we need to establish that Nenets has inverse scope phenomena at all. I did this by testing ambiguities with two generalized quantifiers, like the English example in (11).

(11) *Every teacher likes one student.*

a. surface scope ($\forall > \exists$): For every teacher x there is a student y such that x likes y.

b. inverse scope ($\exists > \forall$): For one student x it is true that every teacher y likes that x.

I have tested the Nenets counterpart of (11). Remember that the canonical word order in Nenets is SOV. With surface structure SOV, both the surface and the inverse scope readings were available. With a scrambled structure OVS where the object ('one student') came first, only the inverse scope reading was available. Having established the existence of different readings for the surface order with individual-type quantifiers, let us now turn to scope ambiguities containing the comparative operator.

In examples like the following, my informants got both the wide scope reading for the degree operator and the wide scope reading for the modal. Example (12-a) shows a predicative comparative disambiguated via context towards the reading where 'want' takes scope over the comparative. Example (13-a) shows a predicative comparative with a different modal, namely the Nenets correlate to 'must' , where this time the comparative operator takes scope over the modal.

(12) **Context**: Zina always wanted to be tall. The height 1.85m is her ideal. The height of her friend Ljusya is 1.80m. Unfortunately, Zina's height does not reach her ideal. She is just 1.70m tall (but Ljusya's does not reach Zina's ideal either).

a. *Zina Ljusya-xad jamb-ŋe ŋes' xarva.*
Zina Ljusya-ABL. long-ESS. be want.3SG.
'Zina wants to be taller than Ljusya (is tall).' (want>COMP)

(13) **Context**: Both Zina and Ljusya are 1.70m tall. Both of them want to become models and want to apply to two different agencies. Zina wants to get into the

agency “Beauty face”, while Ljusya wants to get into the agency “Topmodel”. The minimal height required for “Beauty face” is 1.80m and for “Topmodel” only 1.75m.

a. *Zina Ljusya-xad jamb-ŋe ŋebta tara.*
Zina Ljusya-ABL. long-ESS. be must.3SG.
‘Zina has to be taller than Ljusya (has to be).’ (COMP>must)

Finally, example (14) is an adverbial comparative where the comparative operator again scopes over ‘want’.

(14) **Context**: Vika and Olya both want to learn to play the guitar. Vika wants to play musical pieces in no matter which genre and in any, even difficult arrangement. Olja will be happy, even if she can play the simplest songs with only a couple of chords.

a. *Vika Olja-xad gitara-xana savo-vna sanakuvs’ xarva.*
Vika Olja-ABL. guitar-LOC. good-PROL. play want.3SG.
‘Vika wants to play the guitar better than Olja (wants to play the guitar).’

(COMP>want)

So far, we can therefore conclude that Nenets does have scope ambiguities of the type attitude predicate/modal + COMP that I discuss in section 2.2.2 for Russian. These ambiguities only illustrate real scope ambiguities if the comparative standard is genuinely phrasal, which is the case in Nenets.

In fact, I have also tried to elicit examples from Heim (2001) and Beck et al. (2009), i.e. minimal requirement readings like in (30) (cf. section 1.3.2.1) repeated in (15). These are the ones that work for English, i.e. a language with clausal standards, as well.

(15) (**Context**: The draft is 10 pages.) *The paper is required to be exactly 5 pages longer than that.* (Heim 2001: 224, ex. (28))

a. [exactly 5pp COMP than that] [1 required [the paper be $t_{1,d}$ long]]
MAX($\lambda d.\forall w \in Acc$[5] $\rightarrow$ the paper is d-long in w) = 15pp
‘The minimum length required for the paper is 10 pages.’ (The paper is exactly 15 pp long in those acceptable worlds where it is shortest.)

“MINIMUM REQUIREMENT READING ”

[5] Acc(w): the set of worlds accessible from w

b. required [[exactly 5pp COMP than that] [1 the paper be $t_{1,d}$ long]]
$\forall w \in Acc \rightarrow \text{MAX}(\lambda d.$ the paper is d-long in w) = 15pp
'The paper is exactly 15 pp long in every acceptable world.'

In English, both readings are attested. How about Nenets? According to Beck, Hohaus & Tiemann (2012), with Heim's operator (that we assume for Nenets) we can get minimal requirement readings. However, the following Nenets example only allows for the reading in (15-b), but not the minimal requirement reading.

(16) (**Context**: The draft is 10 pages.)

a. *Padvemda" saml'aŋ-h stranica-h piruwna jamba-rka ŋebta tara.*
The.written 5-GEN. pages-GEN. exactly long-RKA be must.3SG.
'The article is required to be exactly 5 pages longer than that.'
= The article has exactly 15 pages.
≠ The article has 15 pages or more.

Now, the reasons for this might be manifold and I only can speculate about them at this point. First of all, the reason could be (i) methodological. Remember that my informants are presented with the Russian translations of the English sentences. So if I translate the sentence in (16), I encounter problems like the exact translation of the modal 'required' into Russian. Russian modals might work differently from English, cf. e.g. Krasikova (2010). And Nenets modals might work differently again. There is also (ii) the numeral, which could receive an 'at least' or an 'at most' interpretation. In addition, (iii) these ambiguities are notoriously hard to get even in English as I know from own elicitations with English native speakers.

I will now leave aside the Heim-type *exactly*-ambiguities. Since Nenets only has phrasal comparatives, I will conclude from ambiguities like (12-a), (13-a) and (14) that these are real scope ambiguities that require degree abstraction.

Negative Island Effect (NegIs): Importantly, Nenets does not fulfill an important requirement to even test NegIs. Namely, Nenets only has phrasal standards and hence no degree relative clauses that could provide an island for movement. This will be elaborated on shortly.

An example for the effect was given in (29), section 1.3.2.1 and is repeated in (17).

(17) **Mary bought a more expensive book than nobody did.*

This is a point of grammatical variation where, for English, we find NegIs, while, for instance, in Japanese, the construction is judged grammatical (Beck et al. 2009: 11). The NegIs arises when a negative element appears in the *than*-clause. According to von Stechow (1984) and Rullmann (1995), who provide a semantic explanation for NegIs, the ungrammaticality is due to the fact that the maximum degree of the *than*-clause is undefined resulting in the unacceptability of the whole sentence.

(18) *λd.nobody bought a d-expensive book* ↯ maximum undefined!

In Japanese, the sentence is judged grammatical, because the *than*-clause does not describe sets of degrees, but rather sets of individuals (cf. Beck, Oda & Sugisaki 2004). If it is a set of degrees, i.e. syntactically a clause like in English, then we are faced with a real NegIs. Thus, crucially, the prerequisite for testing NegIs is the availability of clausal standards. As I have shown in 2.3.2.1, Nenets does not permit clausal standards. That is why this diagnostics cannot be applied to Nenets. Hence unsurprisingly, only ungrammatical sentences like (19) can be yielded by elicitation.

(19) **Vanya temdavy mir'eta tolangubc' xib'a-xart-xad ni-vy*
Vanya buy.PART. expensive book who-self-ABL. NEG.-PST.PART.
temda.
buy.3SG.
English: '*Vanya bought a more expensive book than nobody did.'

The sentence in (19) is ill-formed. Discussing the reasons why that is would lead too far, but the clear result of this is that NegIs is not a good diagnostics for abstraction over degrees in Nenets.

Therefore, the only true diagnostics for degree abstraction we are left with in Nenets are the aforementioned ambiguities in (12-a), (13-a) and (14). With these I conclude that Nenets does have degree abstraction and thus the positive setting of the DAP, i.e. [+DAP].

4.2.1.3 Degree Phrase Parameter (DegPP)

Let us recall that the DegPP states that "A language {can}/ {cannot} overtly fill the degree argument position of a gradable predicate", cf. Beck et al. (2009). Concerning the syntax, this means that the question is whether the specifier position of the Adjectival Phrase (AP) can or cannot be overly filled either by a trace in a SubC, by a *wh*-word in

a DegQ or by a MP. Let us check the diagnostics for Nenets.

A methodological challenge was again presented by the fact that English-like MPs, DegQs and SubCs are ungrammatical in Russian. Translation tasks from Russian to Nenets were thus not feasible as a test method. Instead, I used acceptability judgments again after having constructed the relevant target constructions in advance. These were then presented in a context, and the informant was asked to judge the acceptability of that construction in the given context.

Let us look at DegQs, MPs and finally SubCs. The example in (20) provides negative evidence showing that the English-like DegQ does not work in Nenets.

(20) **Context:** Jana bought a bed. You want to know from her the exact length of the bed.

a. **S'an* *vava-r* *jamb*?
how.much bed-POSS.2.SG. long
Literally: 'How much is your bed long?'
Intended: 'How long is the bed?'

The elicitation only yielded questions of the form in (21) which are paraphrases, i.e. nominalizations to be more precise.

(21) a. *Vava-r* *shaŋar*?
bed-POSS.2.SG. which-size
Literally: 'Your bed is which size?'

b. *S'an* *jambad* *xojka*[6]?
How.much length bed
'What is the length of the bed?'
'Of which size is your bed?

—DEGREE QUESTION (DEGQ)—

Note that it is crucial to elicit negative evidence as in (20) in order to rule out the existence of the English-type constructions. In addition, it is telling that there is only a rescue strategy like a nominalization to express the same notion. Next up are MPs. Again, English-type MPs are not available in Nenets as illustrated in (22). Again, a nominalization of the predicate serves as the rescue strategy, as shown in (23).

[6]The word *xojka* is a borrowing from Russian.

(22) **Polina jur" si"jv ju" ŋapoj santimetr jamb.*
Polina hundred seven ten one centimeters long
Intended: "Polina is 1.71 m (171 cm) tall."

(23) *Polina-h ly-da jur" si"jv ju" ŋapoj santimetr.*
Polina-GEN. height-POSS.3.SG. hundred seven ten one centimeters
'Polina's height is 1.71m (171 cm).'

—Measure Phrase (MP)—

Unsuprisingly, English-like SubCs are not available in Nenets, as well. The reason is that it is not possible to even construct the relevant sentence, since there are no clausal standards in Nenets whatsoever. However, this is exactly the prerequisite for SubCs in the first place. The closest that I got to something like an English SubC in Nenets is the construction in (24).

(24) *Stol-vah pirc'a-rka, komod-vah ŋani lata-rka.*
Table-POSS.1.PL. high-RKA commode-POSS.1.PL. whereas wide-RKA
'Our table is high, wheareas our commode is wide.'[7]

—Subcomparative (SubC)—

Both the positive and negative evidence shows that constructions that would overtly fill the Spec,AP are not available. We conclude that Nenets has the negative setting of the DegPP.

Summarizing, Nenets has the parameter setting [+Dsp], [+Dap], [-DegPP]. With that setting, it joins Russian, Turkish, Guaraní, Romanian and Spanish from the Beck et al. (2009)-sample.

[7]Note that adding the suffix *-rka* produces a meaning difference here. The more literal translation is: 'The table is kind of tall, whereas the commode is kind of wide.'

Lang\ Constr.	**DiffC**	**CompDeg**	**NegIs**	**Scope**	**DegQ**	**MP**	**SubC**	**Parameter setting**
Motu		no	n.a.	n.a.	no	no	n.a.	[-Dsp], [-Dap], [-DegPP]
Japanese	yes	%	no	no	no	no	no	
Chinese	yes	yes	no	no	no	no	no	[+Dsp],
Mooré	yes	yes	n.a.	no	no	no	n.a.	[-Dap],
Samoan	yes	yes	n.a.	no	no	no	n.a.	[-DegPP]
Yorùbá	yes	yes	n.a.	no	no	no	n.a.	
Russian	yes	yes	yes	yes	no	no	no	
Turkish	yes	yes	n.a.	yes	no	no	n.a.	
Guaraní	yes	yes	yes	yes	no	no	no	[+Dsp], [+Dap],
Romanian	yes	yes	yes	yes	(no)	(no)	(no)	[-DegPP]
Spanish	yes	yes	yes	yes	(no)	(no)	(no)	
Nenets	**yes**	**yes**	**n.a.**	**yes**[8]	**no**	**no**	**n.a.**	
English	yes	yes	yes	yes	yes	yes	yes	
German	yes	yes	yes	yes	yes	yes	yes	
Bulgarian	yes	yes	yes	yes	yes	yes	yes	[+Dsp], [+Dap],
Hindi-Urdu	yes	yes	n.a.	yes	yes	yes	n.a.	[+DegPP]
Hungarian	yes	yes	yes	yes	yes	yes	n.a.	
Thai	yes	yes	yes	yes	yes	yes	yes	

Table 4.1: Adding Nenets to the Beck et al. (2009) Sample

We have updated Table 1.1 from section 1.3.2.1 by adding Nenets to the cross-linguistic picture. We will now turn to the analysis of a Nenets comparative without *-rka*.

[8] For reasons explained in sections 2.3 and 4.2.1 the ambiguities with minimal requirement readings do not work here. The diagnostics I applied contained a modal/attitude predicate + a comparative, cf. the construction in (12-a).

4.2.2 Analysis of an Example without *-rka*

After having determined the parameter setting in Nenets comparatives, I will now take a closer look at comparative constructions in Nenets and propose an analysis. The construction under investigation in this subsection is (4) repeated in (25).

(25) *Katya Masha-xad pirc'a.*
Katya Masha-ABL. tall
'Katya is taller than Masha.'

We have established in section 2.3 that Nenets (i) lacks overt comparative morphological marking on the adjective (ii) lacks clausal comparatives and importantly, (iii) uses Heim's phrasal operator. Concerning (i), we will assume that the role of the ablative marking on the standard of comparison acts as a licensor for the covert phrasal operator, i.e. whenever there is ablative case, the covert degree operator is present at LF[9]. Concerning (ii), only the overt material provided by the standard in the syntax will be used as the input to interpretation. The ingredients to our calculation are thus the following. Heim's operator is repeated in (26), the meaning of the gradable adjective is repeated in (27) (remember that Nenets has the positive setting of DSP, i.e. the gradable predicate provides a degree argument slot).

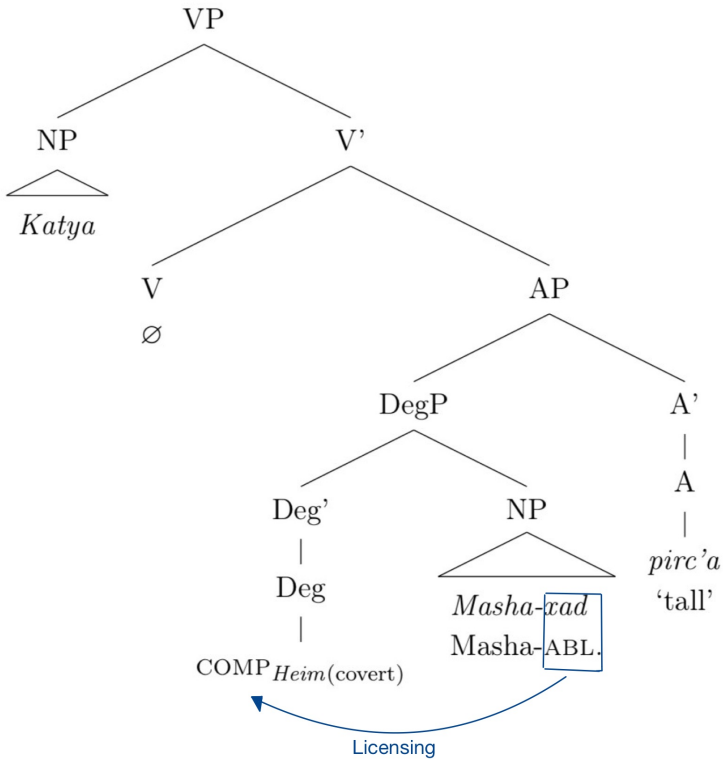
(26) $[\![\text{COMP}_{\text{Heim}}]\!] = \lambda y_e.\, \lambda R_{\langle d,\langle e,t\rangle\rangle}.\, \lambda x_e.\ \text{MAX}(\lambda d.\, R(d)(x)) > \text{MAX}(\lambda d'.\, R(d')(y))$

(27) $[\![pirc'a]\!] = \lambda d.\lambda x.\text{HEIGHT}(x) \geq d = \lambda d.\lambda x.$ x is d-tall

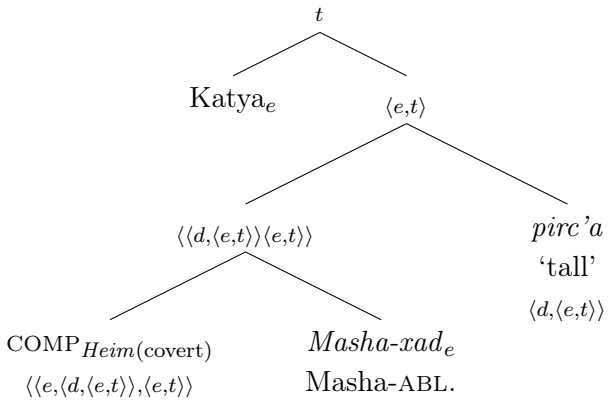
The underlying structure for (25) is in in (28), the LF is in (29) with the composition of the truth conditions in (30). This is a predicative comparative. Here, no parasitic movement is required such that the underlying structure corresponds to the LF, the input to interpretation,

[9] This case marking is not unique for Nenets. We also find ablative marking in comparisons in Turkish (cf. Hofstetter 2009), Persian (cf. Karvovskaya 2013) and other languages.

(28)



(29)



Note that in the LF in (29) the comparative operator forms an LF-constituent with the standard of comparison. Parasitic movement does not need to be performed in this predicative case, cf. footnote 5 in section 2.1.2.

(30) a. $[\![COMP_{\text{Heim(covert)}}\ Mashaxad]\!] = \lambda R.\lambda x.\text{MAX}(\lambda d.R(d)(x)) >$

b. $[\![COMP_{\text{Heim(covert)}}\ \textit{Mashaxad pirc'a}]\!] = \lambda x.\text{MAX}(\lambda d.\ \text{HEIGHT}(\text{x}) \geq d) > \text{MAX}(\lambda d'.R(d')(\text{Masha}))$
$\text{MAX}(\lambda d'.\ \text{HEIGHT}(\text{Masha}) \geq d')$

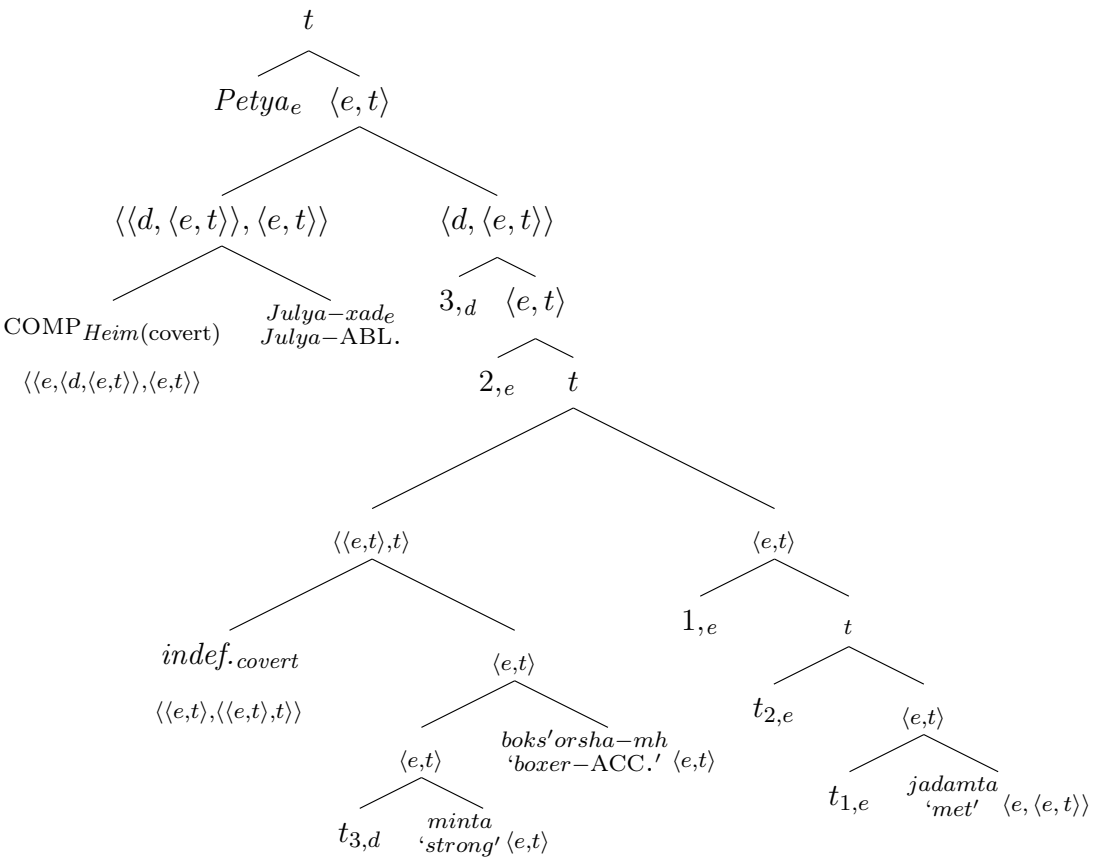
c. $[\![(4)]\!] = \text{MAX}(\lambda d.\ \text{HEIGHT}(\text{Katya}) \geq d) > \text{MAX}(\lambda d'.\ \text{HEIGHT}(\text{Masha}) \geq d')$

Let us look at the composition of the attributive example in (73-a) from 2.3.3 repeated in (31-a). Here, parasitic movement is needed in contrast to the predicative case in (28). I am providing the LF for the external reading in (32), the lexical entries in (33) and the calculation along with the resulting truth-conditions in (34). I am ignoring the contribution of the suffix *-rka* for now.

(31) **Context:** Yesterday Julya told her friend Petya that she recently met a (female) boxer who won 5 matches. Petya remembered that another (female) boxer whom he met recently even won 7 matches (i.e. the boxer which Petya met is even stronger than the one whom Julja met).

a. *Petya Julya-xad minta-rka boks'orsha-mh jadamta.*
Petya Julya-ABL. strong-RKA boxer-ACC. meet.3.SG.
'Petya met a stronger boxer than Julya.'(under the external reading)

(32) LF for EXT of (31-a)



(33) a. $[\![\,\text{COMP}_{(Heim_{covert})}\,]\!] = \lambda y_e.\,\lambda R_{\langle d,\langle e,t\rangle\rangle}.\,\lambda x_e.\ \text{MAX}(\lambda d.\,R(d)(x)) > \text{MAX}(\lambda d'.\,R(d')(y))$

b. $[\![\,minta\,]\!] = [\![\,strong\,]\!] = \lambda d.\lambda x.\text{STRENGTH}(x) \geq d = \lambda d.\lambda x.x$ is d-strong

c. $[\![\,boks'orshamh\,]\!] = [\![\,boxer\,]\!] = \lambda y.y$ is a boxer[10]

d. $[\![\,jadamta\,]\!] = [\![\,met\,]\!] = \lambda a.\lambda b.b$ met a[11]

(34) a. $[\![[\ 1\ [t_{2,e}\ [t_{1,e}\ jadamta]]]]\!] = \lambda x.\ t_{2,e}\ x$ met

[10] I ignore the contribution of case here.

[11] I ignore the contribution of tense here, as well.

b. $[\![\ [_{\langle\langle e,t\rangle,t\rangle}\ \textit{indef.}_{\textit{covert}}\ t_{3,d}\textit{-minta boks'orshamh}]]\!] = [\![\ [_{\langle\langle e,t\rangle,t\rangle}\ \textit{indef.}_{\textit{covert}}\ t_{3,d}\textit{-strong boxer}]]\!] = \exists y\ [\ \text{boxer(y)}\ \&\ \textsc{strength}(\text{y}) \geq \text{d}]$[12]

c. $[\![[_{\langle e,t\rangle}\ 2\ [_t[_{\langle\langle e,t\rangle,t\rangle}\ \textit{indef.}_{\textit{covert}}\ t_{3,d}\textit{-minta boks'orshamh}]\ [_{\langle e,t\rangle}\ [1\ [t_{2,e}[t_{1,e}\ \textit{jadamta}\ ]]]]]]]\!] =$
$[\![[_{\langle e,t\rangle}\ 2\ [_t[_{\langle\langle e,t\rangle,t\rangle}\ \textit{indef.}_{\textit{covert}}\ t_{3,d}\textit{-strong boxer}]\ [_{\langle e,t\rangle}\ [1\ [t_{2,e}[t_{1,e}\ \textit{met}]]]]]]]\!]$
$= \lambda x.\exists y\ [\ \text{boxer(y)}\ \&\ \textsc{strength}(y) \geq d\ \&\ \text{met}(y)(x)]$

d. $[\![\ [_{\langle e,t\rangle}\ [\textsc{comp}_{\textit{Heim}}(\text{covert})\ [\textit{Julyaxad}]]\ [_{\langle e,t\rangle}3\ [_{\langle d,\langle e,t\rangle\rangle}\ 2[_t[_{\langle\langle e,t\rangle,t\rangle}\ \textit{indef.}_{\textit{covert}}\ t_{3,d}\textit{-minta boks'orshamh}]\ [_{\langle e,t\rangle}\ [1\ [t_{2,e}[t_{1,e}\ \textit{jadamta}\ ]]]]]]]]\!] =$
$[\![\ [_{\langle e,t\rangle}\ [\textsc{comp}_{\textit{Heim}}(\text{covert})\ [\textit{than Julya}]]\ [_{\langle e,t\rangle}3\ [_{\langle d,\langle e,t\rangle\rangle}\ 2[_t[_{\langle\langle e,t\rangle,t\rangle}\ \textit{indef.}_{\textit{covert}}\ t_{3,d}\textit{-strong boxer}]\ [_{\langle e,t\rangle}\ [1\ [t_{2,e}[t_{1,e}\ \textit{met}]\ ]]]]]]]]\!] =$
$\lambda z.\textsc{max}(\lambda d.\exists y[\ \text{boxer(y)}\ \&\ \textsc{strength}(y) \geq d\ \&\ \text{met}(y)(z)\ ]) > \textsc{max}(\lambda d'.\exists a[\ \text{boxer}(a)\ \&\ \text{met}(a)(\text{Julya})\ \&\ \textsc{speed}(a) \geq d'])$

e. $[\![\ (31\text{-a})\ ]\!] = \textsc{max}(\lambda d.\exists y\ [\ \text{boxer}(y)\ \&\ \textsc{strength}(y) \geq d\ \&\ \text{met}(y)(\text{Petya})])$
$> \textsc{max}(\lambda d'.\exists a\ [\ \text{boxer}(a)\ \&\ \textsc{strength}(a) \geq d'\ \&\ \text{met}(a)(\text{Julya})])$

As we can see, the analysis with the Heim operator can be extended to cases that require movement, such as the attributive external cases. In these, the parasitic movement is needed in contrast to the predicative cases like (25).

Interim Summary I have provided an analysis of Nenets comparison constructions, so far without the suffix *-rka*. The comparative operator used in the analysis is $\textsc{comp}_{\textit{Heim}}$, cf. section 2.3. Nenets has no overt morphological marking of the standard of comparison. The comparative "meaning" , i.e. the presence of the covert phrasal operator is licensed by ablative marking of the comparative in all comparison constructions except for ConCs. For the predicative cases, everything can be interpreted *in situ*, for attributive cases we make use of the familiar parasitic movement that this operator is able to undergo.

4.3 Analysis of Nenets Comparatives with *-rka*

This section is concerned with solving Puzzle 2 from section 4.1. In the bigger frame of things, i.e. with regard to the more global context of this dissertation, I discuss variation in the differential degree argument of a comparison. More concretely, I again remind the reader of the research questions **Q3** and the hypothesis **H3**:

[12] The problem of the interpretation of the indefinite in the attributive cases was pointed out before, i.e. on p. 35, Chapter 2 and on p. 85, Chapter 3.

(35) **Q3**: What is the semantics of comparison constructions in Nenets (Ch. 4)? In particular:

a. How are comparative constructions best analyzed in Nenets?
b. What is the role of the differential argument?
c. How can degree (predicate) modification be integrated into the analysis?

My main hypothesis that essentially brings together the questions under (35) is:

(36) **H3**: Degree predicate modification in Nenets comparatives provides evidence for Degree Restriction in natural language (similar to Event Identification by Kratzer 1996 and Restrict by Chung & Ladusaw 2004).

I will first provide the data which already challenges claims from descriptive grammars, according to which the suffix *-rka* on the gradable adjective is an optional comparative morpheme (cf. Terezhenko 1947 or Nikolaeva 2014). I will then provide my analysis where I use the operation 'Degree Restriction (DR) in the spirit of Chung & Ladusaw (2004)'s restrict that amounts to degree incorporation in natural language (compare this to noun in corporation in the sense of Chung & Ladusaw 2004).

4.3.1 Brief Overview of Claims Made about *-rka* in the Literature

In Nenets comparatives with an overt standard, the gradable adjective either stands in its unmarked form, although, in some cases, it is also marked by the suffix *-rka*. Nikolaeva (2014) describes in her grammar that the affix *-rka* indicates comparison:

> The comparative affix *-rka* is most often found on predicative and attributive adjectives and on adverbs. This affix indicates comparison.
>
> (Nikolaeva 2014: 133)

However, later in the same grammar, a somewhat contradictory claim to the previous one is made:

> In comparative and superlative constructions adjectives stand in their basic form, although they can take the comparative affix addressed in Chapter 6, Section 2.5. However, it is highly optional and cannot be analyzed as marking the comparative degree.
>
> (Nikolaeva 2014: 174)

In an earlier Russian grammar (Terezhenko 1947), the famous Samoyedic scholar Natalia Terezhenko marks what she takes to be the comparative form of the adjective with the suffix *-rka*, according to the prescriptive rule comparable to English, where we learn three forms of the adjectives in the domain of comparatives and superlatives, i.e. *strong - strong**er** - strongest* or the forms with suppletion *good-better-best*. For Nenets, she proposes to form the comparative like this: *pirc'a* ('tall') - *pirc'a**rka***. Interestingly enough, she translates *pirc'a**rka*** as 'povyshe' (Terezhenko 1947: 55), which literally means 'a little/somewhat taller'. So here already, via this translation she indirectly acknowledges that there is more to *-rka* than just the comparative meaning. One of my informants even suggested that I learn all three forms: *pirc'a* ('tall') - *pirc'a**rka*** - *s'am'an-xat pirc'a* ('all-ABL. tall = of all, the tall one = the tallest') as a paradigm. This shows how powerful these paradigms taken from dominant European languages are in the minds of Nenets speakers. In Russian, there is also the regular forms *sil'nyj* ('strong') -*sil'n**ee*** ('stronger') - *samyj sil'nyj* ('most strong'). So the pattern is simply copied from the Russian grammar, at least prescriptively for Nenets native speakers who receive formal instruction for Nenets in schools.

The most laconic but accurate description can be found in Décsy (1966) who classifies *-rka* as an adjectival suffix which can mark "**incompleteness of quantity**" (i.e. *veva* ('bad') - *vevarka* ('slighty, somewhat bad')), and which in addition, according to him, can also be used for comparison (Décsy 1966: 59). Décsy's example for a use in a comparison is:

(37) *Juno te-xed ŋarka-rka.*[13]
horse deer-ABL. large-RKA
'The horse is taller (larger) than the deer.'

To sum up, we have seen that there is no consensus in the existing descriptive grammars about the actual status and meaning contribution of our protagonist, the suffix *-rka*. Just by examining descriptive grammars, we are left with the unsatisfying result that the status and meaning contribution of *-rka* in comparisons is unclear.

In what follows, I will unveil the enigma and provide a formal semantic analysis for this suffix in Nenets comparative constructions.

[13]The glossing of the example is mine.

4.3.2 Data

My fieldwork data suggest that (i) *-rka* is used if there is a small difference between the associate and the standard of comparison and that, moreover, (ii) it is not the comparative morpheme, i.e. not a morphological reflex of a comparative operator COMP.

Another strategy to build a comparison in Nenets is by using the adverbial *piruwna* which was translated by my consultants as *compared to*[14]. This adverbial was used in examples where the adjective was marked by *-rka*:

(38) a. *Masha piruwna Katya pirc'a.*
Masha compared to Katya tall
'Compared to Masha, Katya is taller.'

b. *Masha piruwna Katya pirc'a-rka.*
Masha compared to Katya tall-RKA
'Compared to Masha, Katya is a little bit taller.'

The adverbial *piruwna* is doing the job of establishing a comparison. The suffix-*rka* only changes the meaning by adding the 'little bit', so a specification that Katya is a little bit taller than Masha. The position of the adverbial *piruwna* is surely interesting here and the question remains about the exact semantics of this type of comparison[15].

Example (39-a) shows a comparison between two individuals with *-rka* present on the adjective. It is established in the context that 5cm is a small difference.

(39) **Context:** Katya is 1.75m tall. Masha is 1.70m tall.

a. *Katya Masha-xad pirc'a-rka.*
Katya Masha-ABL. tall-RKA
'Katya is a little taller than Masha.'

In (40-a), I give another example containing the suffix.

(40) In this case I provided a picture context showing a reindeer and a dog. The reindeer is slightly taller than the dog.

[14]The Nenets-Russian dictionary by Terezhenko (2003) proposes the translation *naravne* which means 'on a par, in a line'.

[15]I refer the interested reader to Hohaus (2015) who explores the idea of *compared to* being a frame setter that introduces a presupposition about possible minimal situations thus indirectly giving a value to the free contextual variable. In her analysis, *compared to* and the standard are thus not arguments of the comparative operator.

a. *Ty wen'e-kohod pirc'a-rka.*
reindeer dog-ABL. tall-RKA
'The reindeer is (a little) bigger than the dog.'
Comment by informant: "Here, the speaker is not quite sure. As if the speaker is not sure whether the reindeer is taller than the dog."

Here, I interpret the informant's comment in the following way: if the difference between the reindeer and the dog is not big, then it is actually hard to tell who is really taller/bigger, i.e. whether the comparison holds. If the difference was big, then it would be absolutely clear that one individual is taller than the other, i.e. there would be no problem to make the comparison. The next example is a CompDeg (Comparison to a Degree).

(41) *Polka sind'etyuh santimetr-xad jamb(-rka).*
Shelf eighty cm-ABL. long-(-RKA)
'The shelf is a little longer than 80cm.'
Comment by informant: "If we add the ending *-rka*, we want to make clear that the shelf is a little longer."

As is, again, illustrated by the consultant's comment, we add *-rka* if there is a small difference between the associate and the standard.

The following example is crucial for the intuition that we want to model in the analysis. It illustrates that if we make explicit by an adverb that the difference in height between the two individuals is big, adding *-rka* to the gradable adjective makes the sentences infelicitous, cf. (42-b).

(42) a. *Katya Masha-xad ŋarka-vna* ***pirc'a.***
Katya Masha-ABL. large-PROL. tall
'Katya is a lot (by large) taller than Masha. '

b. *Katya Masha-xad ŋarka-vna* ***#pirc'a-rka.***
Katya Masha-ABL. large-PROL. tall-RKA
Literally: 'Katya from-Masha by-large a little taller.'
'Katya is a lot taller than Masha.'
Comment by informant: "If there is a big difference in heights, you cannot use *-rka*."

Several consultants provided this same comment in this example independently of each

other (in different recording sessions, in different locations, and even different field trips). This intuition will be important for our analysis. I provide some more examples which show that when we establish that the difference between the individuals compared is big (counting as big in the context), using *-rka* becomes infelicitous.

(43) Katya and Masha are both not tall. However, the difference in height between Masha and Katya is 25cm, i.e. Katya is 1.45m tall, Masha only 1.20m tall.

a. *Katya Tanya-xad pirc'a.*
Katya Tanya-ABL. tall.
'Katya is taller than Tanya.'

b. #*Katya Tanya-xad pirc'a-rka.*
Katya Tanya-ABL. tall-RKA.
'Katya is taller than Tanya.'

c. %*Katya pirc'a*[16].
Katya tall
'Katya is tall.'

In the next example both the associate and the standard of comparison are small. Again, when the standard of comparison and the associate are provided, the bare form of the adjective works. In this case, adding *-rka* also works, because the difference between the two individuals is only 2 cm, i.e. very small. This holds even when the polarity of the adjective changes.

(44) Katya is 1.45m tall, while Tanya is 1.43m tall.

a. *Tanya Katya-xad n'ud'a.*
Tanya Katya-ABL. small.
'Tanya is smaller than Tanya.'

b. *Tanya Katya-xad n'ud'a-rka.*
Tanya Katya-ABL. small-RKA
'Tanya is a little smaller than Tanya.'

c. *Tanya n'ud'a-rka.*
Tanya small-RKA
'Tanya is a little smaller.'

d. *Katya pirc'a-rka.*
Katya tall-RKA
'Katya is taller.'[17]

[16]Except for two of my consultants, using the bare adjective in this context does not work. That is why I am putting a % sign there. I will address ConCs in more detail in 4.3.4 when discussing Puzzle 1.

e. *Katya Tanya-xad pirc'a.*
Katya Tanya-ABL. tall.
'Katya is taller than Tanya.'

f. *Katya Tanya-xad pirc'a-rka.*
Katya Tanya-ABL. tall-RKA.
'Katya is a little taller than Tanya.'

And finally, if both individuals are tall, but the difference between the two is small, using the bare form of the adjective or the adjective with *-rka* works.

(45) Katya is 1.95m tall, while Tanya is 1.92m tall.

a. *Katya Tanya-xad pirc'a.*
Katya Tanya-ABL. tall
'Katya is taller than Tanya.'

b. *Katya Tanya-xad pirc'a-rka.*
Katya Tanya-ABL. tall-RKA.
'Katya is a little taller than Tanya.'

What do we learn from these examples? No matter how big the difference between the two individuals and regardless of the polarity of the adjective, the strategy of using the form: 'ASSOCIATE–STANDARD–GRADABLE PREDICATE' always works. Adding *-rka* is only possible when it is established in the context or given by an explicit differential degree that the difference is small. Using the bare form of the adjective in a ConC is not felicitous for most speakers.

In the analysis section that follows the present one, the example in (46) will be in the center of attention. It is a DiffC (Differential Comparative), i.e. it contains an overt differential degree, namely 5cm. Again, it is established in the context that 5cm is in fact considered a small difference.

(46) *Katya Masha-xad saml'aŋg santimetra-nh pirc'a-rka.*[18]
Katya Masha-ABL. five cm-DAT. tall-rka
'Katya is 5 cm taller than Masha.'

I want to emphasize that this example rules out the possibility of *-rka* being the differential argument itself or an operator that quantifies it off, since that argument slot is

[17] I will address this example of a ConC in section 4.3.4.

[18] One consultant's comment to the DiffComp in (46) was: "*pirc'arka* is belittling and caressing. So as not to offend Masha."

already saturated by 5cm. The examples also shows that *-rka* itself is not the comparative morpheme, since it is optional or, like in example (42-b), even blocked when the difference between the associate and the standard is big. I conclude that this optional suffix *-rka* is not the comparative marker,i.e. there is no overt morphological marking on the comparative in Nenets (with the caveat that in contextual comparatives it might be turning into an obligatory comparative morpheme, cf. Puzzle 1 in 4.3.4).

4.3.3 The Analysis: Modifying Differential Degrees

Example (46) indicates that the *-rka* cannot be the differential argument itself. I will claim that *-rka* modifies the differential argument instead. The contribution of *-rka* is that of a degree modifier, namely a condition on the differential, namely that the difference is small. In our analysis, we need a way to accommodate that. Compare this to English. In English, we could replicate the effect by directly modifying an explicit differential, which is, of course, ungrammatical.

(47) **Katya is 5 cm a little/slightly/somewhat taller than Masha.*

The question is whether *-rka* operates on the assertional level at all. Another possibility is that it adds a presupposition on the differential argument saying that the difference has to be small. I will discuss this possibility in section 4.3.5 where I talk about the repercussions on the proposed analysis and will refute this possibility on the basis of some data I collected for Nenets.

As a first ingredient, I will now introduce the individual lexical entries, the building blocks that I assume for the composition. As a second ingredient, I will discuss the phenomenon of restriction in grammar which is important for our analysis. I will first provide examples and existing analyses for RESTRICT (cf. Chung & Ladusaw 2004) and EVENT IDENTIFICATION (EI) (cf. Kratzer 1994,1996) and then draw parallels to my Nenets case. This will be the second important ingredient of the analysis which will introduce a new compositional principle DR, the semantic glue needed for the composition.

4.3.3.1 Ingredient 1: The Necessary Lexical Entries

Le us now think about the meaning of the individual components. First, the suffix *-rka*. I will analyze it as a degree modifier that provides a predicate of small degrees. It is not plausible for *-rka* to introduce its own degree via existential closure, for instance, since

-rka can also appear outside of comparisons. Also, for reasons I will lay out shortly, there will be an abstract *-rka*, $\textit{-rka}_{\text{abstract}}$, that carries the actual meaning licensed by the *-rka* we see realized on the gradable adjective. I give the lexical entry of $\textit{-rka}_{\text{abstract}}$ in (48).

(48) $[\![\textit{-rka}_{\text{abstract}}]\!]^{c} = \lambda d.d \text{ is small}_{c}$

Of course, the adjective 'small' itself is context-dependent, since it has to be established what counts as small in the context, hence the little c-subscript.

Next, the covert comparative operator. Remember that Nenets uses Heim's phrasal comparative operator (crucial evidence for this operator from Chapter 2: DP-external readings of attributive comparatives). The comparative operator is covert and is licensed by ablative marking on the standard of comparison. Heim's operator needs to be tweaked in order to accommodate an argument slot for a differential degree. I am adding an additional argument slot for the differential degree, cf. (49).

(49) $[\![\text{COMP}_{(\text{Heim}_{\text{diff}})}]\!] = \lambda y_e.\underline{\lambda d_{\text{diff}} d}.\, \lambda R_{\langle d,\langle e,t\rangle\rangle}.\, \lambda x_e.\ \text{MAX}(\lambda d'.\, R(d')(x)) \geq \text{MAX}(\lambda d''.\, R(d'')(y)) + d_{\text{diff}}$

This is standardly done for clausal comparative operators, cf. (51) from Beck (2011: 1347). Interestingly, the usual clausal operator in (17), Chapter 1, repeated in (50) for your convenience is actually deducible from the lexical entry in (52) that contains a differential closed off existentially within the entry.

(50) $[\![\text{COMP}_{(\text{clausal})}]\!] = \lambda D'_{\langle d,t\rangle}.\, \lambda D_{\langle d,t\rangle}.\ \text{MAX}(D) > \text{MAX}(D')$

(51) $[\![\text{COMP}_{(\textit{clausalDiff})}]\!] = \lambda D'_{\langle d,t\rangle}.\lambda d_{\text{diff}}.\, \lambda D_{\langle d,t\rangle}.\ \text{MAX}(D) \geq \text{MAX}(D') + d_{\text{diff}}$

(52) $[\![\text{COMP}_{(\textit{clausal})}]\!] = \lambda D'_{\langle d,t\rangle}.\, \lambda D_{\langle d,t\rangle}.\ \exists d_{\text{diff}}\ [d_{\text{diff}} > 0 \quad \& \ \text{MAX}(D) \geq \text{MAX}(D') + d_{\text{diff}}]$

The clausal version of the differential in (52) could easily be adopted for our phrasal operator, cf. (53):

(53) $[\![\text{COMP}_{(\textit{Heim}_{\text{detailed}})}]\!] = \lambda y_e.\, \lambda R_{\langle d,\langle e,t\rangle\rangle}.\, \lambda x_e.\exists d_{\text{diff}}\ [d_{\text{diff}} > 0 \ \ \& \ \text{MAX}(\lambda d'.\, R(d')(x)) \geq \text{MAX}(\lambda d''.\, R(d'')(y)) + d_{\text{diff}}]$

However, this is not the path I am aiming for in Nenets. For me, existential closure will

happen in the syntactic structure itself as opposed to the lexical entry. So what I do in (49) is to transfer this standard procedure of integrating a differential degree to a phrasal operator, namely Heim's.

I will provide analyses for both a case with an overt differential degree and without such a degree (just with *-rka*) shortly in 4.3.3.3. I want to emphasize here that it is not possible to have a different Schönfinkelization of the comparative operator in question because of the existence of DP-external attributive readings in Nenets. We need parasitic movement in order to derive these readings which a differently schönfinkeled operator, where the relation provided by the gradable adjective comes first, (i.e. Kennedy's operator) cannot undergo.

4.3.3.2 Ingredient 2: Restriction in Natural Language

This section is concerned with restriction in natural language. I provide two examples, one from the domain of events and the other from the domain of individuals. This ingredient will be concerned with a new compositional principle that represents the semantic glue in my analysis.

Chung & Ladusaw's RESTRICT The RESTRICT-operation aims, among other things, at capturing examples of noun incorporation like (54). These are cases of predicate restriction in which an argument must not be saturated, but has to be somehow incorporated in the composition.

(54) **John dog-fed Fido.* (Chung & Ladusaw 2004: 5)

This example, of course, is not grammatical in English, but there are quite a few languages that have such structures. An example from Chamorro, an Austronesian language, is in (55).

(55) *Gaäï*-[*ga'*] *yu'* ***kätu***, *lao matai.*
AGR.have-pet I cat but AGR.die
'I had a pet cat, but it died.' (Chung & Ladusaw 2004: 104)

In (55), the incorporated object can be doubled by an independent NP, i.e. we have an extra object (in boldface). The standard rules of composition cannot handle this. For examples like these the authors propose a mode of composition named RESTRICT. I

apply it to the English example in (54).

(56) a. $[\![\textit{fed}]\!] = \lambda y.\lambda x.x$ fed $y = fed'(y)(x)$[19]

b. $[\![\textit{dog-fed}]\!] = \lambda y.\lambda x.x$ fed $y \wedge y$ is a dog $= fed'(y)(x) \wedge dog'(y)$

via **RESTRICT**

c. $[\![\textit{dog-fed Fido}]\!] = \lambda x.x$ fed Fido $\wedge$ Fido is a dog
$= fed'$(Fido)$(x) \wedge dog'$(Fido)

via FA (FUNCTION APPLICATION), cf. (6-d) in Chapter 1

d. $[\![\textit{John dog-fed Fido}]\!] = fed'$(Fido)(John)$\wedge dog'$(Fido)
= John fed Fido and Fido is a dog via FA

The important step of the composition via RESTRICT is provided in (56-b). Note that the internal argument slot of the predicate does not get saturated by the predicate 'dog'! The authors call (predicate) restriction[20] a "nonsaturating mode of composition" (Chung & Ladusaw 2004: 2). The result of restricting the predicate with property p ('dog') is the original function with its domain restricted to the subdomain of its original domain to elements with the property p.

Kratzer's Event Identification: RESTRICT with Events Kratzer (1994,1996) puts forward the idea that external arguments (i.e. subjects) are not arguments of the verb. External arguments are introduced by 'Voice'. She dubs the principle which is needed to compose the VP containing the internal argument with Voice **EVENT IDENTIFICATION**[21]. EVENT IDENTIFICATION (EI) is a conjunction operation that works as follows:

(57)

f	g	→	h
$\langle e, \langle v, t\rangle\rangle$	$\langle v, t\rangle$	→	$\langle e, \langle v, t\rangle\rangle$
			$\lambda x_{\mathrm{e}}.\lambda e_{\mathrm{v}}.f(x)(e) \wedge g(e)$

If we have as an input the functions f of type $\langle e, \langle v, t\rangle\rangle$ and g of type $\langle v, t\rangle$ (order irrelevant) that we want to compose, we get the function h of type $\langle e, \langle v, t\rangle\rangle$ as an output. The input function f and the output function h are of the same type. Event Identification

[19] Again, here as before already, I ignore the contribution of tense since it is not important for my analysis.

[20] I mostly just call it "restriction".

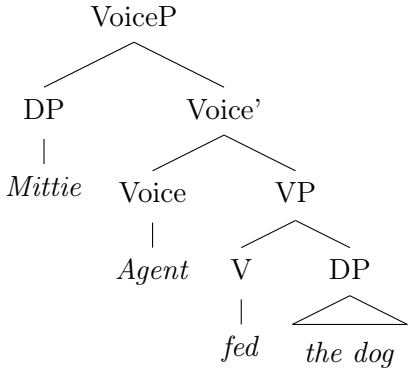
[21] A reminder for types: v is the type for events, e the type for individuals and t the type of truth values, cf. 1.3.1.

(EI) allows one to add various conditions to the event that the verb describes; Voice, for example, adds the condition that the event has an agent. Let us look at an example sentence and its composition.

(58) *Mittie fed the dog.*

(58) has the structure in (59). The lexical entries and the semantic composition are in (60-a) and (60-b).

(59)



(60) a. $[\![fed]\!] = \lambda x_{\mathrm{e}}.\lambda e_{\mathrm{v}}.fed'(x)(e)$
$[\![Agent]\!] = \lambda x_{\mathrm{e}}.\lambda e_{\mathrm{v}}.Agent(x)(e)$
$[\![Mittie]\!] =$ Mittie

b. $[\![fed\ the\ dog]\!] = \lambda e_{\mathrm{v}}.fed'$ (the dog) (e)
$[\![[_{\mathrm{Voice'}} Agent\ [_{\mathrm{VP}}\ fed\ the\ dog]\ ]]\!] = \lambda x_{\mathrm{e}}.\lambda e_{\mathrm{v}}.[\mathrm{Agent}\ (x)(e) \wedge fed'(\mathrm{the\ dog})(e)]$
via **Event Identification**
$[\![[Mittie\ [_{\mathrm{Voice'}} Agent\ [_{\mathrm{VP}}\ fed\ the\ dog]]]]\!] = \lambda e_{\mathrm{v}}.[\mathrm{Agent}\ (\mathrm{Mittie})(e) \wedge fed'(\mathrm{the\ dog})(e)]$

Event Identification makes it possible to chain together various conditions for the event described by a sentence. The agent argument of the VP is not an argument of the V, but is still identified with the same event. In the analysis that we will be adopting for Nenets, we will be using a very similar composition principle, this time in the domain of degrees.

Let us now compare restrict and Event Identification in the following table. So what does this "operation" do? In both cases, i.e. for restrict and Event Iden-

[22] By "operation" I mean either restrict or Event Identification.

	higher-type function f	lower-type function g	function after OPERATION[22]: h
events	$\langle e, \langle v, t\rangle\rangle$	$\langle v, t\rangle$	$\langle e, \langle v, t\rangle\rangle$
individuals	$\langle e, \langle e, t\rangle\rangle$	$\langle e, t\rangle$	$\langle e, \langle e, t\rangle\rangle$

Table 4.2: Comparison between RESTRICT and EVENT IDENTIFICATION

TIFICATION no saturation of an argument takes place. Basically, we have an elaborate type of conjunction where the OPERATION allows us to tie together something of a higher type and a lower type. Assuming that the predicate is interpreted as a function g, the result is that the domain of the function g gets restricted by property p (which can be a property of individuals or a property of events) to a subdomain having that property p.

The compositional principle that I will need for my analysis is parallel to both RESTRICT and EI. I will need to compose something of a higher type, namely type $\langle\langle d, \langle d, \langle e, t\rangle\rangle\rangle, \langle e, t\rangle\rangle$, with $rka_{abstract}$ that has type $\langle d, t\rangle$. I will generalize this principle to a rule that I illustrate in (61). I call it DEGREE RESTRICTION, i.e. DR.

(61) **Rule for DEGREE RESTRICTION:**

a. If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then for any assignment g, α is in the domain of $[\![\ ]\!]^{\mathrm{g}}$ if both β and γ are, and β is of type $\langle d, t\rangle$ and γ is of type $\langle\langle d, \langle d, \langle e, t\rangle\rangle\rangle, \langle e, t\rangle\rangle$, then:
$[\![\alpha]\!]^{\mathrm{g}} = \lambda d_{\mathrm{d}}.\lambda R_{\langle d, \langle e, t\rangle\rangle}.\lambda x_{\mathrm{e}}.\ [\![\gamma]\!]^{\mathrm{g}}(d)(R)(x)=1 \wedge [\![\beta]\!]^{\mathrm{g}}(d)=1.$

b. shorter version:
If $\alpha = \{\overbrace{\beta \quad \gamma}\}$, and $[\![\beta]\!]^{\mathrm{g}} \in D_{\langle d, t\rangle}$ and $[\![\gamma]\!]^{\mathrm{g}} \in D_{\langle\langle d, \langle d, \langle e, t\rangle\rangle\rangle, \langle e, t\rangle\rangle}$, then:
$[\![\alpha]\!]^{\mathrm{g}} = \lambda d_{\mathrm{d}}.\lambda R_{\langle d, \langle e, t\rangle\rangle}.\lambda x_{\mathrm{e}}.\ [\![\gamma]\!]^{\mathrm{g}}(d)(R)(x)=1 \wedge [\![\beta]\!]^{\mathrm{g}}(d)=1.$

This rule is designed specifically for phrasal comparatives using Heim's degree operator. It can easily be accommodated for clausal or other phrasal comparatives:

(62) For any type α this will give us:
$\langle d, \langle \alpha, t\rangle\rangle + \langle d, t\rangle = \langle d, \langle \alpha, t\rangle\rangle$

The important part is that it allows us to combine a degree predicate (which will be ultimately the meaning of our protagonist *-rka*) with the meaning of a higher-type degree function the first argument of which is a differential degree that will be modified. As illustrated by Table 4.3, the following parallel to the two other conjunction operations, namely RESTRICT and EI, can be drawn:

	higher-type function f	lower-type function g	function after OPERATION: h
events	$\langle e, \langle v, t\rangle\rangle$	$\langle v, t\rangle$	$\langle e, \langle v, t\rangle\rangle$
individuals	$\langle e, \langle e, t\rangle\rangle$	$\langle e, t\rangle$	$\langle e, \langle e, t\rangle\rangle$
degrees	$\langle d, \langle \alpha, t\rangle\rangle$	$\langle d, t\rangle$	$\langle d, \langle \alpha, t\rangle\rangle$

Table 4.3: Adding Degrees to the Picture

In this table, we see that the result of the composition is the higher-type function f we start out with, just restricted by g to a certain subdomain, in our case the domain of small degrees.

4.3.3.3 Compositional Analysis of two Examples

In my analysis, differential comparatives play a crucial role. According to the data provided in 4.3.2, in a case where an explicit standard of comparison is present and the difference between the two individuals is established to be small in the context, *-rka* states that the difference between the two individuals is small. So, despite the fact that on the surface the suffix is attached to the gradable predicate, semantically, at LF, it needs to modify the differential degree which sits under the DegP, as we will see shortly. The overt *-rka* will however not be the one that is interpreted. Its job is to license the presence of the covert suffix *-rka*$_{\text{abstract}}$ (perhaps via feature transmission or a similar mechanism).

The goal of my analysis is to implement this aspect into my solution and show that this problem is not idiosyncratic to Nenets, but a general problem of differential comparatives (cf. Alrenga, Kennedy & Merchant 2012, Alrenga & Kennedy 2014[23]). I will now briefly explain this problem. Alrenga & Kennedy (2014) develop a new analysis for clausal comparatives in English in order to derive the observed range of interpretations, especially in cases with scope interactions of the comparative component with other scope-bearing elements. They postulate a silent occurrence of the negative differential degree quantifier *no* (which appears overtly in sentences like *Sarah is no taller than Frank is.*) and give the standard clause, i.e. the *than*-constituent, the role of an existential quantifier over degrees. For differentials they observe that in an example like *Frank is exactly 2cm taller than Frank is*, when the differential scopes over *than*, we get the correct truth conditions, but not if the differential scopes below the *than*-clause. Their way out is to use the differential with a maximality semantics in the matrix clause (that

[23] I am grateful to Rajesh Bhatt, p.c., for bringing this problem and the references to my attention.

we are by now very familiar with) and a specific silent operator "NO_{MAX}" in the standard clause. However, in an earlier paper, albeit just in a footnote, Alrenga, Kennedy & Merchant (2012) say that compositionally, they would need to assume that differential phrases take scope above the standard constituent. I will not provide the details of the analysis here. The crucial point is this: Their analysis runs into the problem that even though the degree head itself takes high scope, the differential still must stay lower in the structure, namely next to the adjective. In the framework that we are using differentials are arguments of the degree heads and these heads can sometimes have high scope. Therefore, the general problem is that the differential can appear lower in the structure than it should semantically.

In Nenets the picture is, however, different: Contrary to English, the differential can appear in several other positions in the sentence. I show this in the following examples. Our crucial example in (46) can receive the following different orderings in Nenets (the differential is in square brackets each time):

(63) a. [*Saml'aŋg santimetra-nh*] *Katya Masha-xad pirc'a-rka.*
five cm-DAT. Katya Masha-ABL. tall-rka
'Katya is 5 cm taller than Masha.'

b. *Katya* [*saml'aŋg santimetra-nh*] *Masha-xad pirc'a-rka.*
Katya five cm-DAT. Masha-ABL. tall-rka
'Katya is 5 cm taller than Masha.'

c. *Katya Masha-xad pirc'a-rka* [*saml'aŋg santimetra-nh*].
Katya Masha-ABL. tall-rka five cm-DAT.
'Katya is 5 cm taller than Masha.'

Not all of my informants accepted all of the orders, but all accepted the word order in (63-b), where the differential is between the associate and the standard, i.e. is rather high in the structure. Importantly, the observed observation did not have a semantic effect. For my analysis this means that the differential does not need to be adjacent to the A-*rka* complex, unlike in English. Therefore, in my analysis, -rka_{abstract} will build a constituent together with the degree head and the standard of comparison, i.e. [-rka_{abstract} [COMP ($\text{Heim}_{\text{diff}}$) standard]]. The placement of the differential will be illustrated in the LFs.

Analysis of a DiffC (comparison with an overt measure phrase). We are now equipped with every ingredient needed for the compositional analysis. I am providing the lexical entries and the compositional principle DR here again for the reader's convenience:

(64) lexical entries:

a. $[\![\text{-}rka_{\text{abstract}}]\!]^{c} = \lambda d.d$ is small_{c}

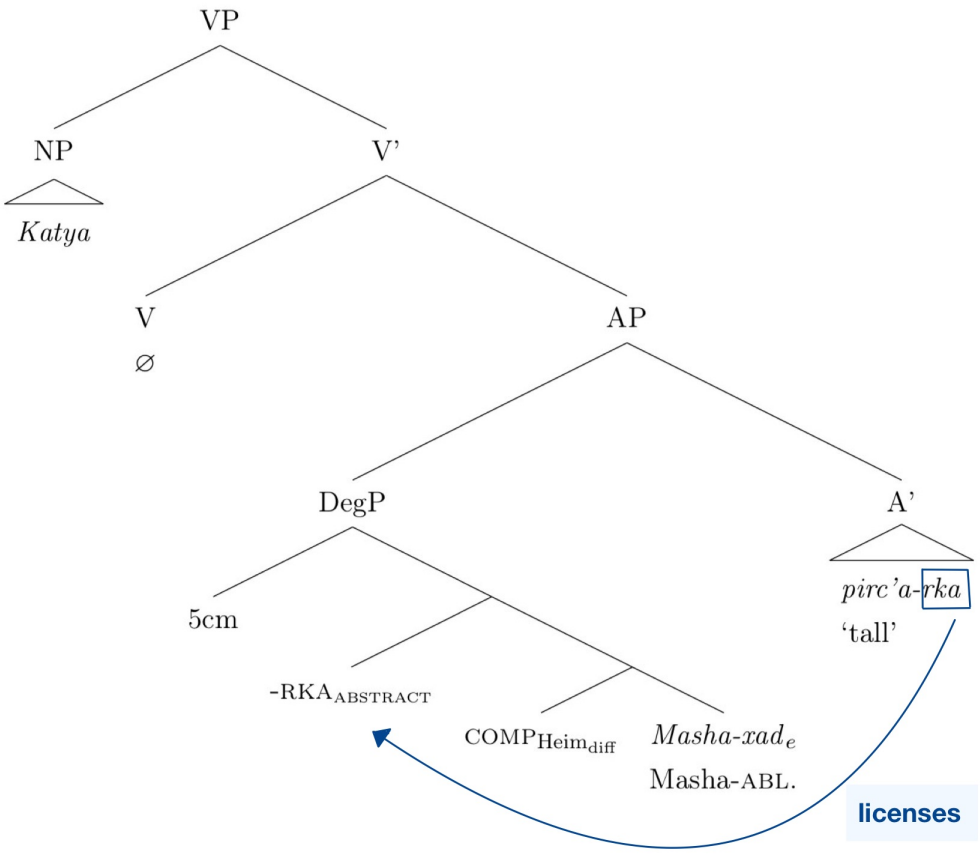
b. $[\![\text{COMP (Heim}_{\text{diff}})]\!] = \lambda y_e.\underline{\lambda d_{\text{diff}d}}.\, \lambda R_{\langle d,\langle e,t\rangle\rangle}.\, \lambda x_e.\ \text{MAX}(\lambda d'.\, R(d')(x)) \geq \text{MAX}(\lambda d''.\, R(d'')(y)) + d_{\text{diff}}$

c. $[\![pirc\text{'}a]\!] = \lambda d.\lambda x_e.\ \mu_{height}(x) \geq d$

(65) DR, shorter version:
If $\alpha = \{\overset{\frown}{\beta\ \gamma}\}$, and $[\![\beta]\!]^{g} \in D_{\langle d,t\rangle}$ and $[\![\gamma]\!]^{g} \in D_{\langle\langle d,\langle d,\langle e,t\rangle\rangle\rangle,\langle e,t\rangle\rangle}$, then:
$[\![\alpha]\!]^{g} = \lambda d_{d}.\lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x_{e}.\ [\![\gamma]\!]^{g}(d)(R)(x)=1 \wedge [\![\beta]\!]^{g}(d)=1.$

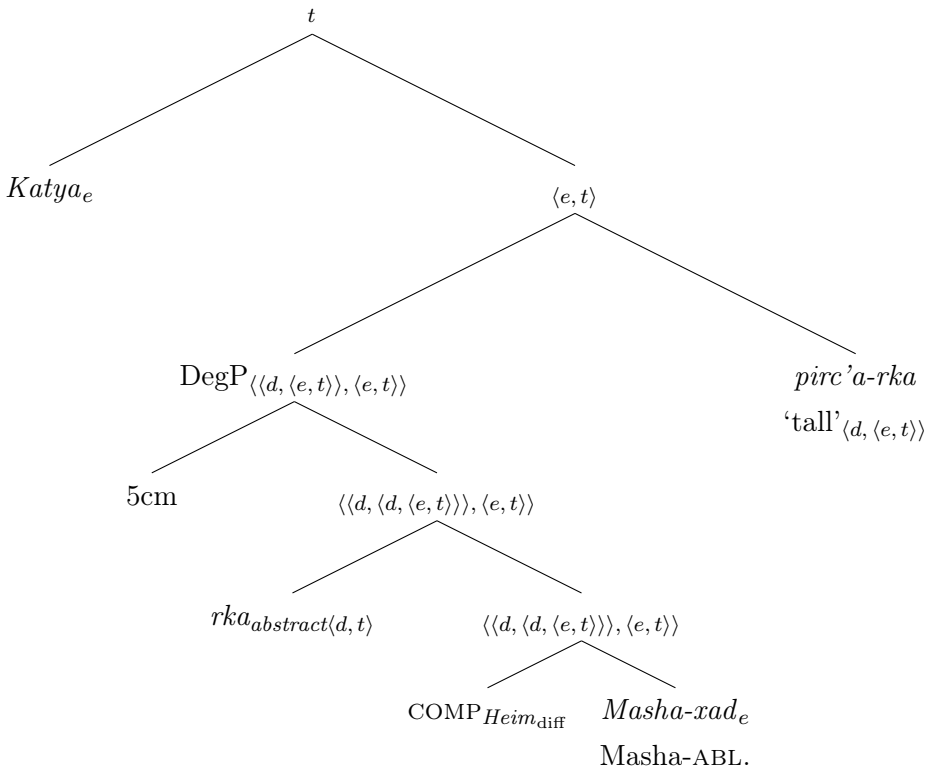
I will start by the sentence in (46) where an overt measure phrase, namely 5 cm, is explicitly stated. I will take the sentence in (63-b) as the baseline for the underlying structure. The underlying structure is in (66), the LF in (67), the composition and resulting truth conditions are in (68).

(66) Underlying Structure



I am providing the LF in the following. Note that the structure [ASSOCIATE-DIFFERENTIAL-STANDARD-PREDICATE] is just the same as on the surface in (63-b) minus the covert material, i.e. the abstract *rka* and the covert comparative operator which are licensed by the overt *-rka* and by ablative case, respectively. Again, for this example it is not critical to move the DegP and the associate Katya and to create the degree relation taken by the operator via parasitic movement. That is why I am leaving everything *in situ* at LF. The movement is, of course, crucial for other examples, for instance the attributive ones.

(67) LF



(68) semantic composition:

a. $[\![\,\text{COMP}_{(Heim_{\text{diff}})}Mashaxad\,]\!] = \lambda d_{\text{diff}}.\lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.\text{MAX}(\lambda d'.R(d')(x)) \geq \text{MAX}(\lambda d''.R(d'')(Masha)) + d_{\text{diff}}$

(via FA)

b. $[\![\,[\mathbf{rka_{abstract}}[\text{COMP}_{(Heim_{\text{diff}})}Mashaxad]]\,]\!] = \lambda d_{\text{diff}}.\lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.$ $\text{MAX}(\lambda d'.R(d')(x)) \geq \text{MAX}(\lambda d''.R(d'')(Masha)) + d_{\text{diff}} \wedge$ **$\mathbf{d_{diff}}$ is small$_\mathbf{c}$**

(via **DEGREE RESTRICTION** (**DR**))

c. $[[\![\,5cm[rka_{\text{abstract}}[\text{COMP}_{(Heim_{\text{diff}})}Mashaxad]]\,]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.$ $\text{MAX}(\lambda d'.R(d')(x)) \geq \text{MAX}(\lambda d''.R(d'')(Masha)) + \underline{5cm} \wedge \underline{5cm}$ is small$_\text{c}$

(via FA)

d. $[\![5cm[rka_{\text{abstract}}[\text{COMP}_{(\text{Heim}_{\text{diff}})}\ Mashaxad\ [pircarka]]]]\!]$
$= \lambda x.\text{MAX}(\lambda d'.\text{HEIGHT}(x) \geq d') \geq \text{MAX}(\lambda d''.\text{HEIGHT}(Masha)) \geq d'' + 5cm) \wedge 5cm$ is small$_c$

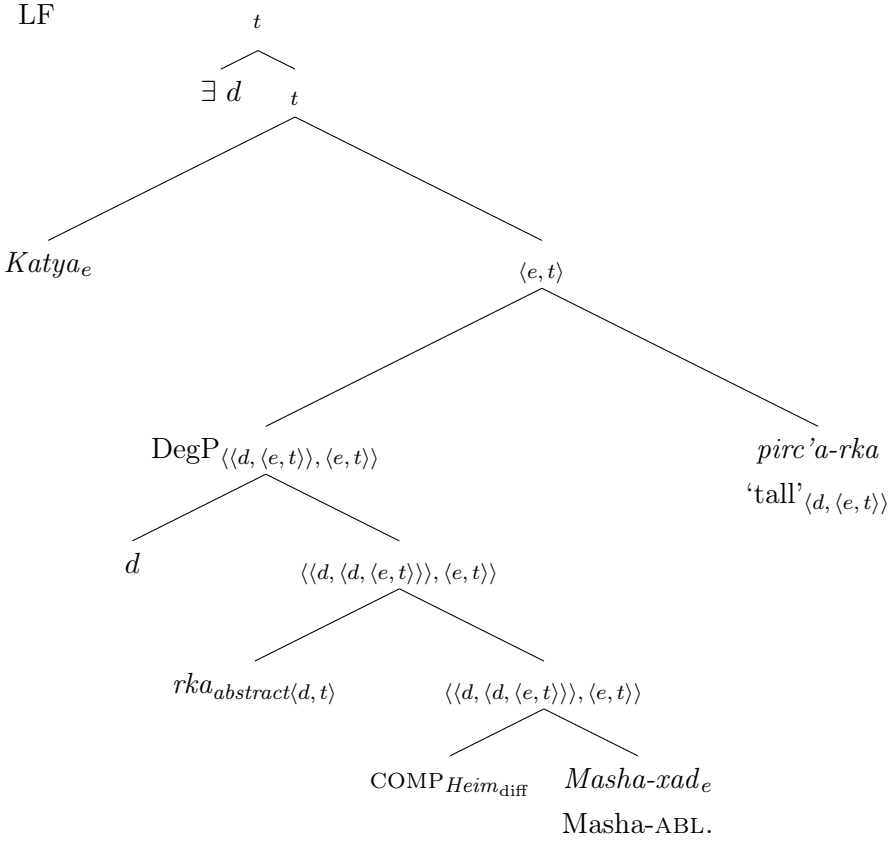
(via FA)

e. truth conditions for (63-b):
$[\![\text{(63-b)}]\!] = 1$ iff $\text{MAX}(\lambda d'.\text{HEIGHT}(Katya) \geq d') \geq$
$\text{MAX}(\lambda d''.\text{HEIGHT}(Masha)) \geq$
$d'') + 5cm \wedge 5cm$ is small$_c$

We get the desired truth conditions that can be paraphrased as follows: "The maximal degree of height that Katya reaches (or, in other words, Katya's height) exceeds Masha's height by 5cm and 5cm is a small value in c." Importantly, *-rka*$_{\text{abstract}}$ comes in at a point in the composition where the differential degree is not yet saturated, so it can operate on it before it gets saturated by FA. I compose $rka_{abstract}$ with its sister node of type $\langle\langle d, \langle d, \langle e, t\rangle\rangle\rangle\langle e, t\rangle\rangle$ by DR from (61). The appeal of the proposed analysis becomes rather evident here: We have just modified an already existing rule that is very much in the spirit of other generalized modification principles that we see elsewhere (RESTRICT and EI) and keep all the rest of the machinery standard.

Comparisons without Explicit Differential. I will now proceed to the underlying structure for example (39-a) that does not contain an overt differential. I will use the comparative operator in (49), i.e. the one that takes the differential degree as one of its arguments. The differential argument must be integrated in this way in Nenets so that *rka*$_{\text{abstract}}$ can operate on it and restrict the differential degrees to small degrees. As in the case with the overt differentials, the LF is again parallel to the underlying structure, because in this predicative case there is no need for movement. The difference is that now we add a free variable d and existential closure that quantifies over this variable at the top of the tree. Note that this is not a trivial, however a common assumption to make. I am decomposing the phrasal COMP-operator into a COMP$_{(\text{diff})}$ and existential closure ($\exists$) of the differential. $\exists$ is often assumed high in the structure, cf. i.a. Heim (1982). This is what I also do in my LF in (69).

(69) LF



(70) semantic composition:

a. $[\![\, \text{COMP}_{(Heim_{\text{diff}})} Mashaxad \,]\!] = \lambda d_{\text{diff}}.\lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.\text{MAX}(\lambda d'.R(d')(x)) \geq \text{MAX}(\lambda d''.R(d'')(Masha)) + d_{\text{diff}}$

(via FA)

b. $[\![\, [\mathbf{rka_{abstract}}[\text{COMP}_{(Heim_{\text{diff}})} Mashaxad]] \,]\!] = \lambda d_{\text{diff}}.\lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.$ $\text{MAX}(\lambda d'.R(d')(x)) \geq \text{MAX}(\lambda d''.R(d'')(Masha)) + d_{\text{diff}} \wedge$ **$\mathbf{d_{diff}}$ is small$_{\mathbf{c}}$**

(via **Degree Restriction** (**DR**))

c. $[[\![\, [d[rka_{\text{abstract}}[\text{COMP}_{(Heim_{\text{diff}})} Mashaxad]]] \,]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.$ $\text{MAX}(\lambda d'.R(d')(x)) \geq \text{MAX}(\lambda d''.R(d'')(Masha)) + \underline{d} \wedge \underline{d}$ is small$_{\text{c}}$

(via FA)

d. $[\![\, [[d[rka_{\text{abstract}}[\text{COMP}_{(Heim_{\text{diff}})} Mashaxad\ ]]]\ [pircarka]\ ] \,]\!] =$ $\lambda x.\text{MAX}(\lambda d'.\text{HEIGHT}(x) \geq d') \geq \text{MAX}(\lambda d''.\text{HEIGHT}(Masha) \geq d'' + d) \wedge d$ is small$_{\text{c}}$

(via FA)

e. $[\![\ [\ Katya\ [[\ d[rka_{\text{abstract}}[\text{COMP}_{(Heim_{\text{diff}})} Mashaxad\ ]]]\ [pircarka]\ ]]\ ]\!] =$

$\textsc{max}(\lambda d'.\textsc{height}(Katya) \geq d') \geq \textsc{max}(\lambda d''.\textsc{height}(Masha) \geq d'' + d) \wedge d$ is small_{c}

(via FA)

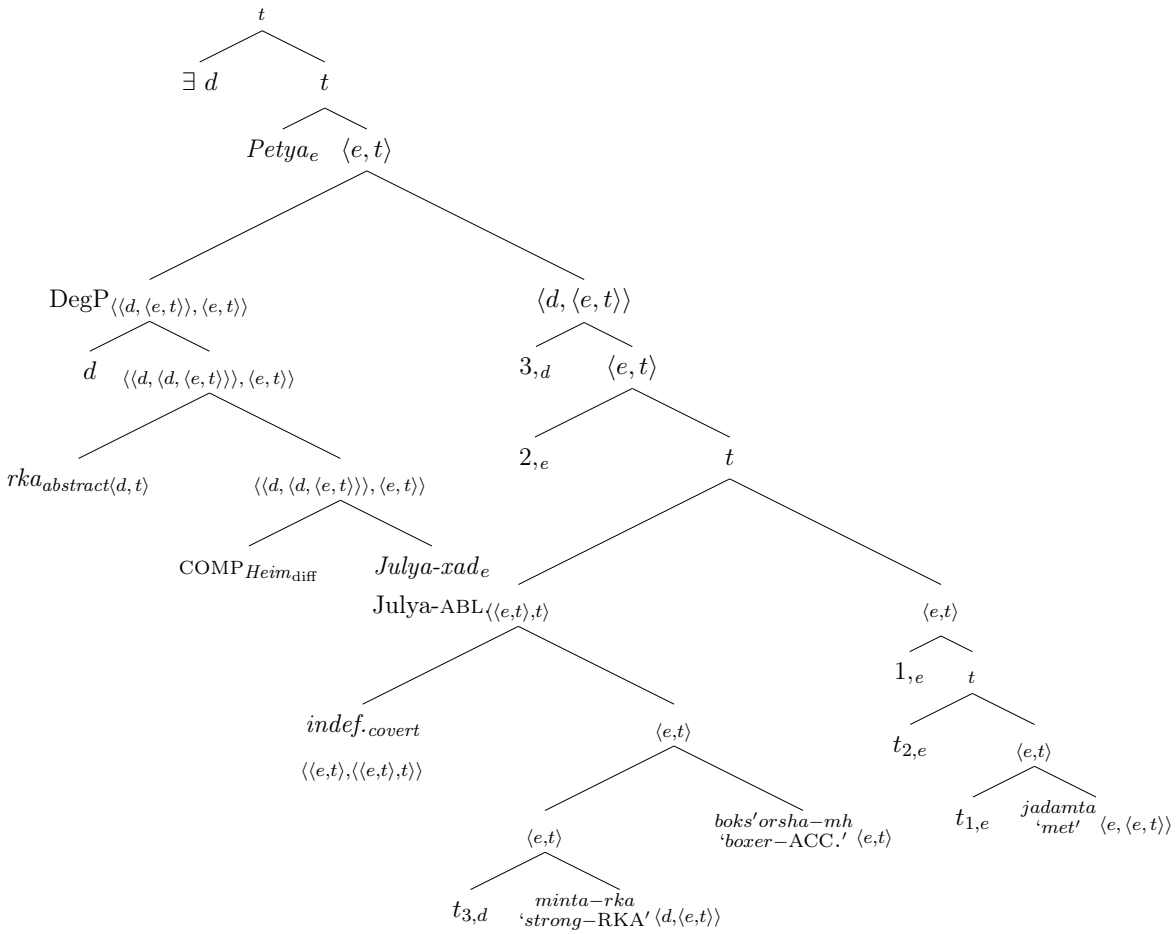
f. $[\![\text{(39-a)}]\!] = \exists d[\textsc{max}(\lambda d'.\textsc{height}(Katya) \geq d') \geq$
$\textsc{max}(\lambda d''.\textsc{height}(Masha) \geq d'' + d) \wedge d$ is small_{c}]

(via Existential Closure ($\exists$))

The desired outcome are the truth conditions that can be paraphrased as: "There is a degree d such that Katya's height exceeds Masha's height by d and d is small in the context." .

Now that we know how to deal with constructions containing *-rka* plus overt differential phrases or covert differential phrases, let us proceed to the attributive case from (73-a) (Chapter 2)/(31-a) where we first ignored the contribution of the suffix. We are now equipped to analyze it considering *-rka*. I will now revise the analysis provided in example (74), section 4.2.2. The LF is in (71) and the resulting truth conditions after the step-by-step calculation are in (72).

(71) LF of (31-a) with *-rka*



(72) ⟦ of (31-a) ⟧ = $\exists d$ [MAX($\lambda d'.\exists y$ [boxer(y) & met(y)(Petya) & STRENGTH(y) $\geq$ d']) $\geq$ MAX($\lambda d''.\exists z$ [boxer(z) & met(z)(Julya) & STRENGTH(z) $\geq d'' + d$])$\wedge d$ is small$_c$]

"There is a degree d such that the strength of a boxer that Petya met exceeds the strength of a boxer Julya met by d and d is small in the context."

One clear strength of my analysis is that it is able to account not only for the predicative, but also for complex attributive cases as well, i.e. the range of available constructions. Remember that Alrenga & Kennedy (2014) ran into the following problem with differentials: although the degree head itself could, in principle, take high scope, the differential still must stay lower in the structure, i.e. adjacent to the adjective. As we have seen in the examples in (63), in Nenets the differential can be high in the structure. So I assume that even if the degree head takes high scope, as it is the case in the LF in (71), the

differential can move along with it in Nenets. This should be corroborated by further data from Nenets by testing whether in attributive cases like example (31-a) a differential could be inserted. For now, I will assume that it is possible.

Interim Summary For sentences with an overt standard and *-rka*-marking on the adjective, I have provided an analysis in which at LF the abstract *rka* that is licensed by the presence of the overt *-rka* forms a constituent with the covert degree head and the standard of comparison. Besides, there must be a differential degree which can be explicitly stated by a value like 5cm or not be explicitly stated, in which case it is a free variable that is existentially quantified off. This complex DegP can raise and bind the degree variable down below in the tree which is, in turn, restricted to small degrees by DR. The consequences are that the semantically relevant *-rka*$_{abstract}$ is not inside the degree predicate. It modifies the degree argument provided by the covert degree head and constrains the relevant difference degrees to small degrees thus making the difference between the individuals small. This nicely captures the intuition illustrated in the data section 4.3.2 that whenever *-rka* is present, the difference measured between the two individuals that we compare needs to be small. In order to compose *rka*$_{abstract}$ with its sister constituent, I have provided the operation that I call Degree Restriction (DR) that shows the need for a compositional mode similar to the well-known RESTRICT or EI in in the domain of individuals and events, this time in the domain of degrees. No other additional technical machinery was added, just this one mode of composition.

4.3.4 Coming back to Puzzle 1: Contextual Comparatives

I will now come back to discussing the peculiar behavior of Nenets contextual comparatives from Puzzle 1 in section 4.1. Let us first look at the data again. In examples like (5) repeated in (73), when provided out of the blue without any context, Nenets native speakers would translate the unmarked form by *Katya is tall.* and the *-rka*-marked form with the comparative meaning *Katya is taller.* or by *Katya is tall.* The unmarked form of the adjective was also translated as a comparative by some speakers, if the suitable context was provided and one individual was taller than the other.

(73) *Katya pirc'a-(rka).*
Katya tall-(RKA)
'Katya is taller.'

Examples (74-a) and (44-d) repeated in (74-b) show that when in the context both individuals compared are established to be small, the bare adjective cannot be used, i.e. it cannot carry the comparative meaning in it by its own. However, when *-rka* is added, the comparison becomes acceptable.

(74) Katya is 1.45m tall, while Tanya is 1.43m tall.

a. %*Katya pirc'a.*
Katya tall
'Katya is tall.'

b. *Katya pirc'a-rka.*
Katya tall-RKA
'Katya is (a little) taller.'

To add to the complexity of the data picture, in such a crisp judgment context (cf. Kennedy 2007) as presented in (74), where there is only a minimal difference in the heights of the girls and where it is established that both girls are small, two of my informants still accepted the sentence without the suffix. So, can, after all, the unmarked form of the adjective carry the comparative meaning for some speakers?

Here is a possible set of assumptions that would explain the pattern:

i The unmarked adjective is ambiguous between being positive and comparative.

ii When the ablative marking is present, the marked item is interpreted as the standard of comparison.

iii When *-rka* is present on the adjective, this is interpreted as modifying the difference degree argument slot of a comparative.

iv There is strong pragmatic pressure to disambiguate the unmarked form, with some variation between speakers with respect to how strongly the pressure is felt. The default is the positive interpretation.

Those speakers who feel a stronger pragmatic pressure interpret the unmarked form in a suitable context as comparative. However, most speakers only get the default positive meaning for the unmarked form, even in contexts priming the comparative.

From this, I hypothesize that *-rka* in contextual comparatives starts being grammaticalized as a comparative suffix. For the majority of Nenets native speakers, *-rka* is obligatory in ConCs. I claim that this points to an interesting change in progress: Namely that *-rka* starts to turn into a real comparative morpheme. In these cases the

lexical entry for the covert contextual comparative is in (75).

(75) $[\![\text{RKA}_{context.}]\!] = \lambda d'.\lambda R_{\langle d,\langle e,t\rangle\rangle}.\lambda x.\text{MAX}(\lambda d.\lambda R(d)(x)) > d'$

The first argument that the operator takes is a degree, the second is the relation and finally the individual that is the associate of the comparison. This operator shows that contextual comparatives are essentially comparisons with a degree.

In the LF which is sketched in (76-a), there is a silent pronoun d_c. This is the free variable that will be given a value via the variable assignment function g through the context. Note that this LF obviously does not correspond to the Surface Structure. Here, I again just rely on Heim's (1985) analysis, where, on LF, the phrasal operator is discontinuous from its adjective and forms a constituent with the contextual degree pronoun, in this case. The step-by-step computation is in (76) b.-d.

(76) a. [Katya $[_{\langle e,\,t\rangle}$[$\text{RKA}_{\text{context.}}$ d_c] pirc'a]]

b. $[\![[[\text{RKA}_{context.}\ d_c]\ pirc'a]\!]^g = [\![\text{RKA}_{\text{context.}}]\!]\ ([\![d_c]\!]^g)\ ([\![pirc'a]\!]) =$
$\lambda x.\text{MAX}(\lambda d.\text{HEIGHT}(x)) > g(d_c)$

c. $[\![\text{(76-a)}]\!]^g = \text{MAX}(\lambda d.\text{HEIGHT}(Katya)) > g(d_c)$
where $g(d_c)$ is a contextually provided degree

The resulting truth conditions can be paraphrased as follows: "The height that Katya reaches exceeds a contextually provided degree." In these cases *-rka* is a comparative morpheme, just like *-er* in English and not a modifier of the differential degree. From here on, the pattern might generalize in future to comparatives with an overt standard.

I tentatively conclude that ConCs constitute the origin of a change that we are about to witness in Nenets, a change towards a grammaticalization of the *-rka*-suffix on its way to a comparative marker. The analysis suggested in (76) indicates where *-rka* is going: it is not just turning into a licensor of the comparative, like the ablative on the comparative standard, but into a real comparative marker since the meaning component contributing "a little" seems to be disappearing in ConCs. Speculatively, the motor for this change might be the presence of the following ambiguity: Since in ConCs the ablative marking which would license the presence of the covert comparative operator is missing, there arises an ambiguity between the positive and the comparative meaning. To resolve this ambiguity, the optional marker *-rka* is added. Why *-rka*? Well, this is so far the best candidate that we have: it always appears on gradable adjectives in comparatives with an explicit standard and indirectly indicates the presence of a comparative in those cases.

Because, if it optionally modifies the differential degree, then there is a differential degree in the first place and consequently a comparison, too[24].

4.3.5 Repercussions of the Analysis

In this section, I will first briefly address the question of whether *-rka* should rather be treated as non-at-issue content (cf. e.g. M. Simons et al. 2011, Tonhauser et al. 2013), i.e. whether *-rka* could be triggering a presupposition, for instance. Second, in the subsection 4.3.5.1, I will elaborate on the in/availability of DR cross-linguistically.

In the following, I provide some preliminary data from Nenets on the projection behavior of *-rka*. An example is given in (77) where I tried to use an equivalent to the English sentential negation "It is not the case that..." to test the projection behavior of *-rka* under negation.

(77) *Taremh ni ŋa", Katya Tanya-xad pirc'a-rka.*
So NEG Katya Tanya-ABL. tall-RKA
Intended: 'It is not the case that Katya is a little taller than Tanya.'

If *-rka* projected, then the following assertion and PSP (presupposition) could be given for the sentence.

(78) assertion of (77): Is is not the case that Katya is taller than Tanya.
PSP of (77): the difference between the heights is small

If *-rka* could project out of negation, then the PSP, that the difference between the two individuals is small, should survive. However, my Nenets consultants gave me other responses. The most common of all was that the whole predicate including *-rka* is negated. So, in other words, since the facts of Katya being taller than Tanya is negated, we cannot judge anymore whether there is a difference in heights between the two. And since we cannot judge that, we also cannot judge whether the difference is small or not.

The question of the exact status of *-rka* definitely merits more attention in further research. In any case, even if *-rka* introduced not-at-issue content, Degree Restrict and

[24]The other possibility would be to say that $\text{RKA}_{\text{contextual}}$ also only licenses a covert degree head, just like the ablative does. In this case there would be two ways of licensing a degree head in Nenets: either by using the ablative or by using *-rka*. If both the ablative (i.e. the standard) and *-rka* are present, then it has a different function, namely that of a degree modifier. I am not sure whether anything speaks in favor of one or the other solution.

the current semantics of *-rka* as a degree modifier would still be relevant, since PSPs also have to be derived compositionally just the same as the assertive content. I am thus convinced of my current analysis that also covers all relevant cases of comparatives, i.e. not only the predicative, but also the attributive ones, as well as ConCs, DiffCs etc.

4.3.5.1 Thoughts about the Role of Degree Restrict

I would like to start by addressing a potential problem of my analysis. Namely that the usage of the compositional principle of DR overgeneralizes. The question immediately arises why this type of operation should not be available cross-linguistically and across all semantic types. In other words: Why doesn't this work for English? And moreover, why is this not possible for every type in every language? We need a way to put a restriction on where DR can be used since it cannot be freely available as a composition principle in the grammar cross-linguistically. I hypothesize that this principle should be applicable if a language has a construction in which an adverbial like *a little* can modify an overt (i.e. saturated) differential degree as in the example in (79) repeated in (79).

(79) ***Katya is 5 cm a little/slightly/somewhat taller than Masha.*

This is not possible in English. This is a first step towards constraining the application of DR. Now the question stands of how to constrain it to degree types only. The way the rule is formulated in (61) is, in fact, very specific and does not leave any room to transfer it to other domains. It is tailored only for degrees and, moreover, only phrasal comparatives. So this is not a real danger.

Here are some further questions that TN opens up for us: Is Restriction a mode of composition that human language has in every domain, i.e. the domain of individuals, events, degrees etc.? If yes, where is it available and which restrictions is it subject to concerning cross-linguistic variation?

It is known from literature on noun incorporation (cf. e.g. Chung & Ladusaw 2004, Mithun 1984) that languages, as, for instance, Chamorro (Sadock 1980), have a strong version of noun incorporation, where an autonomous noun stem is incorporated into the verb. Mithun (1984) calls this classificatory noun incorporation (CNI), I will call it strong noun incorporation (NI). There are also languages like Greenlandic where no extra noun can be incorporated, but where the verb has some kind of predicate incorporated in its stem (similar to the English example of the verb *to baby-sit*, where such verbs exist but are extremely rare). I will call it the light version of NI. Is something parallel feasible

for degrees, i.e. is there a light and a strong version of DI? Preliminary data from other languages motivate this hypothesis. What is more, the parallelism between NI and DI seems to be even more profound in that one could distinguish between light and strong versions of both NI and DI as shown in the following Table 4.4.

	Noun Incorporation (NI)	**Degree Incorporation (DI)**
"light"	No extra noun ex. *John dog-fed.* e.g. in Greenlandic (C&L 2004: 89)	Comp. with DiffMod[25] ex. *Peter is taller*-DIFFMOD *than Mary.* e.g. in Japanese (with *motto*)
"strong"	Extra noun present ex. *John dog-fed Fido.* e.g. in Chamorro (Sadock 1980: 308)	DiffC + DiffMod ex. *Peter is 3cm taller*-DIFFMOD *than Mary.* e.g. in TN (with *-rka*)

Table 4.4: Comparison between NI and DI

DR cross-linguistically: the Data

Chamorro vs. Greenlandic: Strong NI vs. light NI. Chamorro, an Austronesian language of the Mariana Islands, has both object incorporation that I call "light" NI, and "strong" NI.

(80) **"light" NI in Chomorro:**

a. *Gäi-*[*famagu'un*] *ädyu na palao'an.*
AGR.have-children that L woman
'That woman has children.' (Chung & Ladusaw 2004: 82)

Here, he internal argument is linked to an object that must be incorporated. The extra object is analyzed as being syntactically adjoined via RESTRICT. It is analyzed as not being the complement of the verb because of islandhood.

(81) **"strong" NI in Chomorro:**

a. *Gäi-*[*ga'*] ***un ga'lagu*** *ennao na patgun.*
Agr.have-pet a dog that L child
'That child has a pet dog.' (Chung & Ladusaw 2004: 89)

Now, Greenlandic is different in that nouns which are incorporated into verbs cannot be

[25]DiffMod stands for a differential modifier such as *-rka*.

doubled by an independent DP. Consider the following example in (82).

(82) **only "light" NI in Greenlandic:**

a. *Kusanartunik* *sapangarsivoq.*
beautiful-NOM.-PL.-INSTR. bead-get-INDIC.-3.SG
'He bought beautiful beads.' (Sadock 1980: 308)

The result is that the meaning constructed for the Greenlandic incorporation clause 'I bought beautiful beads' resembles 'I bead-bought and they are beautiful'. In our terms then, the light version of NI exists in Greenlandic, but, as Chung & Ladusaw put it: "nouns in Greenlandic can be associated with stranded modifiers, but they cannot be doubled by an independent DP." (Chung & Ladusaw 2004: 114). This would mean that the strong version of NI does not exist in Greenlandic.

Let us turn to DI and look at some examples from Japanese.

Tundra Nenets (TN) vs. Japanese[26]: Strong DI vs. light DI. According to our mini-typology, TN might have the strong version of DI, while Japanese might only display the light version of DI.

In a ConC like (83), Japanese *motto* contributes the comparative meaning. This is exactly what *-rka* does in ConCs as well, cf. (5). DiffCs exist in Japanese. However, adding *motto* makes the DiffC in (85) infelicitous, cf. (86-a).

(83) *Motto hosii.*
more want
'(I) want (some) more.'

(84) **Context:** Someone says that he thinks that Mary is 5ft and John is just slightly taller than that. The speaker shakes his head and says:

a. *Uun, John-wa* *Mary-yorimo* ***motto*** *se-ga* *takai*
no John-TOP. Mary-than even height-NOM. tall
yo.
sentence.ending.particle
'No no, John is much taller than Mary.'

(85) Differential Comparative (DiffC)

a. *Sally-wa* *Joe yori* *5cm se-ga* *takai.*
Sally-TOP Joe YORI 5cm back-NOM. tall
'Sally is 5cm taller than Joe.' (Beck et al. 2009: appendix, p. 6)

[26] I thank Toshiko Oda for the Japanese judgments.

(86) DiffC + *motto*

a. ??*Sally-wa Joe yori 5cm* ***motto*** *se-ga takai.*
Sally-TOP Joe YORI 5cm motto height-NOM. tall

And even when the difference between the individuals is made big (assuming that *motto* is a counterpart to *-rka* in that it marks a big difference between individuals), the sentence is just as odd as the one in (86-a). Changing the word order was also not helpful. This might point to Japanese only having the light version of DI.

I hope to have shown that further cross-linguistic research could uncover a general mechanism of natural language and give us deeper insight into the inner workings of grammar. Interestingly, TN does not have noun incorporation, i.e. the possibility of incorporating degree expressions seems to be independent of the possibility of incorporation in the nominal domain. As already pointed out in the beginning of this chapter, the need for this new composition principle opens new routes of research. It is not only that this new rule solves an immediate composition problem. I believe that the grammatical generalizations that motivate it are of interest for future cross-linguistic research on incorporation across different semantic domains (the domain of individuals, events, but also degrees).

I will now proceed to two Outlooks, the first one on *-rka* outside of comparison constructions and the second one on *-rka*-like elements in other languages.

4.4 Outlook 1: *-rka* Outside of Comparatives – Cross-Categorial Data

Strikingly, *-rka* is not restricted to the domain of comparatives. In this outlook, I will provide Nenets data showing that *-rka* is cross-categorial in that it appears on nouns, adjectives, verbs and adverbs. This outlook is intended as an incentive to think about the following questions: How do we model scalarity without degrees? How can *-rka* and similar elements cross-linguistically induce gradability where it did not exist before? How can we account for all the instances where *-rka* is cross-categorial? Unfortunately, the outlook will not solve these questions, but just provide cool Nenets data and questions for further research.

4.4.1 Nenets Data

I will begin by examining *-rka* on nouns, continue with *-rka* on adjectives, then verbs and finally adverbs.

***rka* on nouns** Let us first look at some examples given in the literature.

An example from Terezhenko (1947):

(87) *puxuc'a* - old woman; *puxuc'arka* ('less of an old woman')
My consultants' translation: 'not a young woman, but also not an old woman yet'

The following examples are from my fieldwork.

(88) a. *ŋamderc'* - chair, *ŋamderc'arka* - kind of a chair
When I asked one informant to explain what *ŋamderc'arka* meant exactly, she described the following scenario: Imagine your father is not a great craftsman, but he decided to craft a chair. He did, but the final product does not exactly meet the criteria to be called a proper chair. Either it is somewhat crooked, or part of the chair is missing, for example a leg.

b. *neb'a* - mother, *neb'arka* - a mother who kind of fulfills her duties as a mother, but not quite;
ne - woman, *nerka* - kind of a woman (but does not behave like one in all relevant respects)

c. *talej* - thief, *talejrka* - someone who has started being a thief (he might have been spotted stealing once or so)

d. *syra* - snow, *syrarka* - a light snow (as opposed to heavy snow)

e. *sarmik* - a wolf, *sarmirka* - hard to tell whether it is a wolf or not a wolf;
ŋano - a boat, *ŋanorka* - hard to tell whether it is a boat or not

f. *maj"ma* - joy, *maj"marka* - a little joy

What is common to all these examples? Descriptively, when adding *-rka*, there is always some kind of weakening or attenuation of the predicate described. If *-rka* is put on an inanimate object like 'chair' in (88-a), then it is kind of a chair, but not a prototypically ideal chair. That means that something is missing to make it a chair par excellence. If it is an animate subject, one which in human society is often associated with certain typical

properties, like 'a mother' in (88-b), with *-rka* added on the noun something goes missing and it is harder to call this person a mother. So if, for instance, it is considered typical of a mother to take care of the child, be patient, be tender etc.; then a *neb'arka* would lack at least one of these qualities. This attenuation is reminiscent of Décsy's (1966) description already cited in 4.3.1 who classifies *-rka* as an adjectival suffix which can mark "**incompleteness of quantity**" . An interesting case is in (88-e) where the closest English translation of *-rka* would be 'kind of'. In these cases it is hard to determine how much of the wolf quality or how much of the boat quality is left when *-rka* is added.

***rka* on adjectives** We have seen that normally the function of *-rka* on gradable adjectives is that of a modifier of a differential degree. How about non-gradable adjectives? Here is an example from Terezhenko (1947) in which she translates *-rka* as 'less'.

(89) *sar'o* - rainy; *sar'orka* ('less rainy')
My consultants' translation: 'a little bit rainy'

In the dictionary by Terezhenko (2003), the following examples are of interest:

(90) a. *valamberka* - slightly washed out, slightly worn out
b. *vaŋarka* - slightly hollow, slightly immersed (a slightly sunk hole, for instance)
c. *sevs'ada* - blind, *sevs'arka* - purblind, mole-eyed, having bad eyes. An example: *lid'aŋ sevs'arka* - mole-eyed beaver (a beaver who has bad eyes)
d. *iba* - warm, in the same dictionary entry further down: *ibarka* - warmer, slighly warmer

The example in (90-d) contains a gradable adjective. We are familiar with these cases. In the other examples (a-c) *-rka* is attached to absolute adjectives like 'washed out', 'blind', 'hollow' which are not gradable. In these cases *-rka* weakens the absolutive quality: for instance, 'blind' becomes gradable in the sense that the beaver is not totally blind, but rather has bad eyes. Intuitively, *-rka* imposes gradability on absolute adjectives. Next, we will look at the behavior of *rka* with verbs.

***-rka* on verbs** There are many examples of *-rka* with verbs that I found in the literature and elicited myself. However, I will limit myself to only the crucial ones to illustrate my point.

First, I am bringing up some examples from the literature, i.e. Terezhenko's dictionary, which can also be found in Salminen's corpus[27].

(91) a. *Ven' n'ukc'a s'arnera-**rka**.*
Dog youngling squeal-RKA
'The dog puppy is squeling slightly.'

b. *Kniga"amna tolans'o-**rka**.*
books reads-RKA
'He reads books from time to time. /He reads books a little bit.'[28]

c. *Ɔeva-da ŋad'a-**rka**-s'.*
head-POSS.3.SG. be.visible-RKA-3.SG
'His head was only slightly visible./ His head was almost not visible.'

d. *N'am'u-r xan'aŋy meva-xana n'uja*
tongue-POSS.2.SG. which time-LOC. not.be-IMP.3.SG.
*jerv-s'u", s'akalpa-**rka**-d.*
master-CONNEG. bite-RKA-IMP.OBJ.2.SG.
Rather literally: 'Your tongue should not be master over you for once, bite it.'
'Don't say everything that comes to your mind, bite your tongue.'

Our suffix can be attached to different verb forms and modes: to an infinitive, an inflected verb or even, as is the case in (91-d), to the imperative. Let us now look at examples from my fieldwork. Our protagonist *-rka* can appear on **degree achievements**, cf. (92), which is not too surprising if we consider that these are verbs that might make a degree slot available (cf. von Stechow 1996, Kennedy & Levin 2008). However, *-rka* is not limited to degree achievements, but also appears with statives, cf. (94) and activities, cf. (95), which is more unexpected since it is not immediately clear what exactly is being graded. An example of a stative with *-rka* is in (94-a), where the predicate 'knowing mathematics' is weakened by *-rka* in the sense that the Russians do not know all of mathematics, some knowledge on it is missing.

[27] I am greatly thankful to Johannes Dellert for providing me with these corpus examples. They can be accessed at `https://web.archive.org/web/20160902184334/http://www.helsinki.fi/~tasalmin/tn_corpus.html`. The source of Salminen's examples is Terezhenko's dictionary from the year 1965.

[28] This is a hard one to translate. The Russian translation of the verb is 'počityvaet'. It could be translated as "reading a little" or if we interpret the diminished verbal activity as temporal, then we could translate this as "reading from time to time" meaning that a person could read a book with breaks: sometimes interrupting the activity to look out of the window, eat etc. In this case 'books' is in plural, so probably what is meant is that the he does not read books very often, but just occasionally.

(92) *-rka* with **degree achievements**:

a. *Evej xanteve-**rka**.*
Soup cool-RKA
'The soup almost cooled down.'

b. *T'eran tyry-**rka**-".*
Things dry-RKA-PL.
'The things have dried a little (= not completely).'

I am now dividing the examples by Aktionsart of the verb (cf. Vendler 1957, Vendler 1967). First I will show *-rka* on achievement verbs, then on statives and finally on activity verbs.

(93) *-rka* with **achievements**:

a. *Man' xojnih s'as piruv taneje-**rka**-m.*
I hill hour in climb-RKA-1.SG
'I climbed the mountain in an hour after a fashion.[29]'

b. *Marina pesn'a-mh jagarna-**rka**.*
Marina song-ACC. sang-RKA
'Marina sang a song in a low voice/not using her whole voice.'

c. *Man' n'un'a-mh padta-**rka**-m.*
I loon-ACC. draw-RKA-1.SG
'I haven't finalized drawing a loon.'

The following examples contain *-rka* with **stative verbs**.

(94) *-rka* with **statives**:

a. *Luca" matematika-mh teneva-**rka**-du".*
Russians mathematics-ACC. know-RKA-1OBJ.[30]
'Russians know mathematics ...ish.'

b. *Man' sava-nh punry-**rka**-m.*
I good-DAT. believe-RKA-1.SG
'I believe in the good... ish.'

Here are some examples with *-rka* on **activity verbs**.

[29] By 'after a fashion' I want to convey that the climbing was rough and I managed to arrive, but it was not done too well, I barely managed.

[30] By "1OBJ. I indicate object agreement when there is one object, in this case it is mathematics. Nenets distinguishes in object agreement when there are one, two (it also has the dual) or more objects.

(95) *-rka* with **activities**:

a. *Man'a" biblioteka-xana ŋamd'u-**rka**-va".*
We library-LOC. sit-RKA-2.PL.
'We are sitting around a little in the library.'

b. *N'un'ah vyŋ-ana t'oryrŋa-**rka**.*
loon tundra-LOC. cry.3.SG-RKA
'The loon is crying in the tundra from time to time.'

c. *Polina lakri xal'a-mh pire-**rka**.*
Polina recently fish-ACC. cook.3.SG-RKA
'Polina recently cooked a little amount of fish./Polina recently cooked fish a little.'

d. *Man' pis'a-**rka**-m.*
I laugh-RKA-1.Sg
'I laughed a little. = I chuckled.'

e. *Nina tej jal'a ponh televizora-n' syrŋa-rka-s'.*
Nina that day for a long time TV-DAT. watch-RKA-3.SG
'Nina watched TV for a long time (with breaks) yesterday.'

f. *Olga tara-**rka** men'e-da.*
Olga dance-RKA like-3.SG
'Olga likes to dance occasionally/a little.'

g. *Olga pon'ed'el'nik-xana valakada tara-**rka**.*
Olga Monday-LOC. EXCL. dance-RKA
'Polina dances for a short time on Mondays.'

In (95-c), the several possibilities in translation reflect the fact that the sentence could mean that either Polina cooked a small amount of fish or that she has not finished cooking, that the cooking itself was incomplete. Example (95-e) is interesting because there is a duration of the watching event characterized by the adverb *ponh* as being big. However, the verb is marked by *-rka*. The meaning contribution of the suffix in this case is that Nina watched the TV with breaks, the quality of the watching is modified, not the duration itself. The difference between (95-f) and (95-g) is worth mentioning, because when no particular point in time is specified, *-rka* on an activity verb seems variable as to whether the temporal dimension is modified, i.e. whether the dancing is from time to time, or whether the quality of dancing itself is concerned. In that case Olga might dance not using her full power. However, when we add a time adverbial, 'Monday' in (95-g), then the time scale is the one being "attacked" by *-rka* and in this case Olga dances for a short time on Monday. A final example shows how *-rka* can even appear on adverbs.

***-rka* on adverbs**

(96) *Man' mera-rka s'urmbidamz'.*
I quickly-RKA ran
'I shuffled.'

In this last example, the quality of running is again weakened to a shuffling (rather than running).

What is common to all these examples? Abstracting away from the syntactic category, I will now visualize what *-rka* does in a graph.

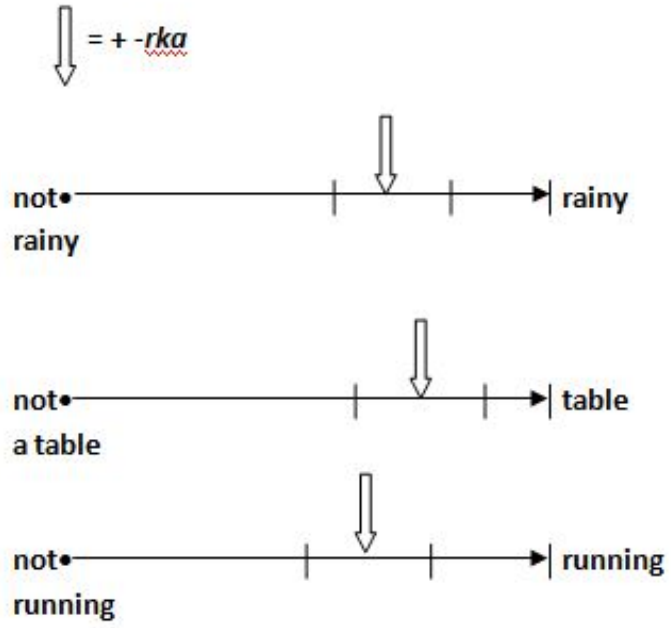


Figure 4.1: The Contribution of *-rka* Expressed with Scales

The graph shows that, if we accept that *-rka* imposes a scale structure on the adjective, noun or verb it modifies, it removes us farther away from the rightmost part of the scale, which would be the full-fledged quality of being a table, for instance. It always diminishes the quality or the amount or the time span.

Interim Summary. Taking my analysis of *-rka* in comparatives seriously, the question that this outlook leaves us with is whether it is extendable to the other domains. The pertinent question is how to model scalarity without degrees or whether there are (some kind of) degrees in domains that are not typically associated with degrees. Since we know

that *-rka* feels quite at home in comparison constructions, the intuition that I would like to model is that *-rka* wants to modify a degree in some way or another. A possible first reflex would be to assume that everything should be gradable, even nouns like *chair* leading to lexical entries like the following:

(97) $[\![chair]\!] = \lambda d.\lambda x.x$ is a chair to d

This might be a too radical, and perhaps too naive, step to take. A more promising path seems to be a line of recent research on vagueness in grammar, more precisely on metalinguistic comparatives (Morzycki 2011), on the metalinguistic degree morpheme *-ish/...ish* (R. Bochnak & Csipak 2014) and hedges like *sorta* or *kinda* (Anderson 2013), but also research by Wellwood (2015) on the semantics of comparison across categories. This literature is concerned, among other things, with the question of coerced gradability, i.e. more globally in the question of how traditionally non-gradable things are made gradable. Maintaining the core meaning of *-rka* for the cross-categorial cases is also the desideratum for a uniform analysis of *-rka*. However, the details of the analysis must be left for future research. The idea that there are degrees of precision that can be modified (Morzycki 2011), could be used for my analysis. A derived notion of gradability is needed, where we locate two predicates, for instance *-rka* V and V along a scale of resemblance with one predicate holding a lesser degree than the other. This would mean that the gradability is not inherent to the predicate, but is rather the work of *-rka* itself.

The suffix-*rka* outside of comparisons is a great candidate to be added to a whole pleiad of expressions that are capable of turning non-gradable things into gradable ones. I also think that this is an area worth exploring and refining further in future research. Thanks to elements like *sorta*, *...ish/-ish* and *-rka*, we might gain insights into phenomena like coerced gradability, scale structure of typically non-gradable elements in language.

4.5 Outlook 2: *-rka*-like Elements Cross-Linguistically – "Small Comparatives"

In this outlook, I want to illustrate that Nenets is not the only language to specifically indicate small differences in comparatives. I will provide examples from other Samoyedic languages, but also Chinese and finally Bulgarian and show that this phenomenon is more universal and deserves to get more attention in the theoretical literature.

Samoyedic Languages. In Forest Enets[31] and Nganasan (Terezhenko 1979), there are suffixes serving a similar purpose as Nenets *-rka*, namely *-rka* in Enets and *-liku* in Nganasan.

Forest Enets

In Forest Enets, which is another Samoyedic language, *-rka* serves a purpose of a diminutive/attenuative which expresses a smaller degree of a certain predicate than the non-marked form. This *-rka* also appears on the adjectives outside of comparison, and then it means: 'tall-ish', 'dark-ish' etc.).

(98) *Nozunh duze-rka-sh.*
I(ABL.) small-**RKA**-3.SG
'He was a bit younger than me.'

The function of *-rka* in Forest Enets seems identical to the Nenets *-rka*. So far, this is not surprising, since the languages stem from the same family. Let us briefly look at Nganasan, another Samoyedic language.

Nganasan

In Nganasan, the complex suffix *-liku* (which presumably developed from the extinct suffix "li"+ the diminutive suffix "ku"[32] according to Lehtisalo 1936), might be a cognate to the Nenets *-rka*.

(99) *Mene taa-ne tagy-tite mere-liku.*
I reindeer-PL.1.SG reindeer-PL.DAT.2.SG fast-**LIKU**
'My reindeer are a little faster than yours.'

(from Terezhenko 1979)

Leaving out the suffix in this example would yield the meaning: My reindeer are faster than yours. This looks exactly like the contribution of *-rka* in Nenets comparison con-

[31] I thank Andrey Shluinsky, p.c. for the examples he provided me with.

[32] I have been looking for a connection between diminutives and *-rka* for Tundra Nenets. However, this connection not easy to establish, because there are designated diminutive suffixes in PDN, e.g. *-ko*, that have already been there in earlier stages alongside *-rka*. Since Castrén (1854,1966) in his 19th century grammar mentions diminutives in connection with comparatives (cf. quote in section 4.2.), a diachronic study would be interesting to conduct. But since writtenness only was established for Nenets in the early 20th century, old Nenets texts are barely existent, except for folklore that has mostly been written down after the fact.

structions.

Summarizing, the Samoyedic languages Forest Enets and Nganasan also have a way of expressing a small difference in comparatives, just like Tundra Nenets. I will now turn to Chinese, a language from a completely different language family.

Chinese. Krasikova (2008: 266) describes that Chinese comparatives always feature the unmarked form of the gradable predicate. Generally, comparative constructions contain a *bi*-phrase that introduces the standard of comparison.

(100) *Lisi bi Zhangsan gao.*
Lisi BI Zhangsan tall
'Lisi is taller than Zhangsan.' (Krasikova 2008: 266)

It is possible to omit BI and add *yidian*, which has the meaning of 'a little bit', after the gradable adjective, and still keep the comparative meaning like in the following examples:

(101) a. *Qing shuo man yidian.*
please speak slow a little bit
'Please speak a little more slowly.'[33]

b. *Da-che hui-jia fangbian yidian.*
hit-vehicle go-home convenient a little bit
'Taking a taxi back home is a little bit more convenient.'

Now, what is conspicuous about the examples is that these are all ConCs that do not contain a standard of comparison. Crucially, without *yidian* the sentences in (101) lose their comparative meaning. Now, this is a very familiar pattern from Nenets. As discussed in section 4.3.4, most speakers of Nenets need to add *-rka* on the adjective in order to get a comparative meaning in ConCs. Descriptively speaking, *yidian* fulfills two functions: it provides the comparatives meaning and, in addition, marks a small difference. This is similar, but not identical to what *-rka* does, since the latter provides the comparative meaning in ConCs, albeit not necessarily the small difference meaning. In any case, *yidian* is interesting, because it links the comparative to the the small difference-component.

[33] I am very grateful to Alexander Wimmer for finding these examples and glossing the Chinese data. In the gloss, I am leaving out some details for the sake of exposition. Source of the examples: `https://resources.allsetlearning.com/chinese/grammar/`

Bulgarian. In Bulgarian, a Southern Slavic language, the prefix *po-* that acts as a comparative morpheme in comparison constructions like (102-a) can accommodate a degree modifier *malko* meaning 'slightly/somewhat' despite the presence of an explicit differential degree, cf. (102-b). This is strongly reminiscent of Nenets, where *-rka* is allowed in DiffComps with an explicit differential in it.

(102) a. *Katja e* ***po****-visoka ot Tanja.*
Katja is PO-tall from Tanja.-
'Katja is taller than Tanja.[34]'

—Comparison between Individuals—

b. *Katja e s 0,5 santimetra malko* ***po****-visoka ot Tanja.*
Katja is with 0,5 cm slightly PO-tall from Tanja
Literally: 'Katja is 0,5 cm slightly taller than Tanja.'
'Katja is 0,5 cm taller than Tanja, and this difference is small.'

—DiffComp small difference—

In the examples above, *po-* acts as a comparative marker. Interestingly *po* can also appear before PPs marking direction, cf. (103-a) and on verbs, cf. (104).

(103) a. *Herrsching se namira* ***po*** *na jug ot München.*
Herrsching itself finds PO to south from Munic
'Herrsching lies a little to the south of Munic.'

—Direction—

(104) a. *Brzaj*!
Hurry
'Hurry up!'

b. ***Po****brzaj*!
Po-hurry
'Hurry a little more!'

—'po' with a Verb—

In (103-a) and (104), *po-* contributes the meaning of 'a little'. In the verbal case in (104), it adds a comparative meaning in addition to 'a little'. However, in a comparison, it does not have to contribute the meaning of a small difference. Yet, the original meaning of *po-*

[34] All these examples stem from elicitation with Marina Petkova, a native speaker of Bulgarian.

seems to be the one we still see with directions and verbs, namely that of a "weakener" (as opposed to intensifier). Bobaljik (2012) makes the following suggestion for Bulgarian *po-* in terms of its diachronic development and function:

> I tentatively suggest that despite appearances it is not the element *po-* that triggers the suppletion in the comparative root, but rather a (synchronically null) comparative affix. This suggestion recapitulates the history of the aberrant nature of Bulgarian and Macedonian comparatives within Slavic. In all other Slavic languages, including Bulgarian up to about the 14th Century (Reiter 1979, 21), the comparative is formed by means of a suffix, typically *-ji-* or *-ši-* or derivatives thereof. The prefix **po-** occurs across Slavic with a weakening or reinforcing function, similar to English rather or somewhat, as, for example, Russian: *po-mlož-e* '(somewhat) younger'< *mlož-e* 'younger', comparative of *molod-oj* 'young'. Across Slavic, *po-* may occur with positive and comparative forms (though not both in all languages; see Reiter 1979,22-25),[...]
>
> Alone in Bulgarian-Macedonian was the original comparative suffix lost, and concomitantly, in a manner reminiscent of the Jespersen cycle of negation, the erstwhile optional reinforcer *po-* became effectively obligatory as the sole overt marker of comparison. (Bobaljik: 193-194)

Rephrasing Bobaljik's quotation, *po-* in Present Day Bulgarian is a sole marker of comparison on gradable adjectives as it has lost its original means to mark the comparison by a suffix. The relation to the intensifier/weakener meaning 'a little/somewhat', however, remains as is visible with directions and verbs. The question then is: what is the semantic relationship between an intensifier like *po-* and a comparative suffix? Descriptively speaking, weakening a quality implicitly creates a comparison between the original quality and the weakened one.

(105) a. *interesting* vs. *somewhat interesting* ≡ less interesting
b. *tall* vs. *somewhat tall* ≡ further away from being tall, i.e. less tall (than tall)

Compare this to the following German examples:

(106) a. *Sie hat ein-en größ-er-en Betrag überwiesen.*[35]
She has a-ACC. big-COMP-ACC. amount transferred
'She transferred a rather big amount of money.'

b. [*ein alter Mann*] vs. [*ein älter-er Mann*]
an old man vs. an old-COMP. man
'an old man' vs. 'a somewhat old man ≡ less of an old man'

In (106-a), the comparative marks a non-typical case of 'being big'. By adding the comparative suffix, the sum that "she" transferred actually becomes smaller than the sum would be if the unmarked form of the adjective *groß* was used. This behavior of the comparative suffix is only detectable in German ConCs, i.e. constructions that lack a standard of comparison. Note that in these cases the comparative suffix behaves just like the intensifier/weakener 'somewhat' and does exactly what *-rka* does with predicates outside of comparisons (as illustrated in Figure 4.1). What if the pattern of applying such an intensifier in ConCs can be generalized when used in comparatives and become a comparative marker instead of only an attenuative modifier. The parallel drawn to German shows that the comparative suffix can serve the same purpose in ConCs, namely weakening of a property. At this point, this idea remains a speculation and needs further scrutiny and systematic research in the future. However, to me it appears a direction worth exploring.

The comparison between Bulgarian *po-* and Nenets *-rka* is interesting because a diachronic development Bobaljik (2012) proposes for Bulgarian *po-* might be feasible for *-rka*, as well. Since in ConCs *-rka* is obligatory for most speakers to obtain the comparative (instead of only the positive meaning), it might be the case the *-rka* is moving from an intensifier/adverb to a comparative morpheme. If such a path of grammaticalization from intensifier to comparative morpheme is feasible for other languages like Bulgarian, then it also might be for Nenets. This would strengthen my proposed analysis for Nenets ConCs in 4.3.4 and contribute to solving Puzzle 1. And what about the enigma concerning small differences? What is the connection between a small difference and a comparison? On a conceptual and very intuitive level, marking a small difference to the standard might generalize to...

1. ...marking a difference to a contextually provided standard no matter whether the difference is big or small.
2. ... then this might generalize to a comparison between two explicitly provided degrees.

Under this scenario, Nenets would represent a language that is in the middle of the grammaticalization process of turning from an intensifier into a comparative suffix while still maintaining the small-difference-component in comparatives with an explicit standard.

[35] Thanks to Manfred Krifka, p.c., for bringing this type of examples to my attention. These cases have been discussed in Blutner (2002).

Interim Summary. In this outlook, I discussed parallels between "small comparative"-markers cross-linguistically. Other Samoyedic languages have suffixes very similar to the Nenets *-rka*. Chinese has an adverbial, namely *yidian* marking a small comparison and even providing a comparative reading in ConCs. And finally Bulgarian has a prefix that seems to have grammaticalized from an intensifier that contributes attenuation into a comparative prefix. German was used to illustrate how a real comparative suffix in ConCs can contribute the meaning of a small difference to the standard of comparison.

I have shown in this outlook that "little comparisons" are not an isolated Nenets phenomenon, but an under-investigated phenomenon that deserves attention from formal linguists who can potentially provide analyses of such (diachronic) developments that will give us a better understanding of this area of grammar.

4.6 Chapter Summary

I started out this chapter with two puzzles: Puzzle 1 about the meaning contribution of *-rka* in ConCs and Puzzle 2 about its meaning contribution in comparisons with an explicit standard. I was able to resolve Puzzle 2 in 4.3 and partly resolve Puzzle 1 in 4.3.4 by proposing an idea of the grammaticalization path of *-rka* towards a comparative morpheme.

Section 4.2.1 established that Nenets (i) has degrees in the grammar of comparatives (i.e. [+DSP], i.e. gradable predicates of the type $\langle d, \langle e, t\rangle\rangle$), (ii) has abstraction over degrees (i.e. [+DAP]) and (iii) that in Nenets the Spec,AP position cannot be overtly filled in Nenets (i.e. [-DEGPP]). In the remainder of this part in section 4.2.2, I demonstrated a compositional analysis of Nenets comparatives without *-rka*.

The centerpiece of this chapter was occupied with the exact contribution of *-rka* in comparison constructions and their composition. The following Table 4.5 summarizes the core results of the present chapter by referring to the construction analyzed, the truth conditions, the comparative operator used and the analytic tools needed for the analysis.

	construction	example	truth conditions	operator	analytic tool(s)	status
w/o *-rka*	expl. st.	*Katya Mashaxad pirc'a.*	$\text{MAX}(\lambda d.\,\text{HEIGHT}(\text{Katya}) \geq d) >$ $\text{MAX}(\lambda d'.\,\text{HEIGHT}(\text{Masha}) \geq d')$	COMP_{Heim}	standard	✓
	DiffC	*Katya 5cm*-DAT. *Mashaxad pirc'a.*	$\text{MAX}(\lambda d.\,\text{HEIGHT}(\text{Katya}) \geq d) >$ $\text{MAX}(\lambda d'.\,\text{HEIGHT}(\text{Masha}) \geq d') + 5cm$	$\text{COMP}_{Heim_{\text{diff}}}$	standard	(cf.Engl.)
	Pos/ConC	*Katya pirc'a.*	ambig. between the pos. and the comp.	POS?/COMP?	?	?
with *-rka*	expl. st.	*Katya Mashaxad pirc'arka.*	$\exists d[\text{MAX}(\lambda d'.\text{HEIGHT}(Katya) \geq d') \geq$ $\text{MAX}(\lambda d''.\text{HEIGHT}(Masha) \geq d'' + d) \wedge d$ is $\text{small}_c]$	$\text{COMP}_{Heim_{\text{diff}}}$	DR + ∃	✓
	DiffC	*Katya 5cm*-DAT. *Mashaxad pirc'arka.*	$\text{MAX}(\lambda d'.\text{HEIGHT}(Katya) \geq d') \geq$ $\text{MAX}(\lambda d''.\text{HEIGHT}(Masha) \geq d'') + 5cm \wedge 5cm$ is small_c	$\text{COMP}_{Heim_{\text{diff}}}$	DR	✓
	ConC	%[36] *Katya pirc'arka.*	$\text{MAX}(\lambda d.\text{HEIGHT}(Katya)) > g(d_c)$ where $g(d_c)$ is a contextually provided degree	$\text{RKA}_{\text{context}}$[37]	standard	✓

Table 4.5: Nenets Comparison Constructions

Explanations:

- column "construction": expl. st. = explicit (overt) standard; DiffC = Differential Comparative; ConC = Contextual Comparative
- column "operator": POS?/COMP? - according to my data, the unmarked form might be analyzed as a positive construction, cf. Engl. *Lara is tall.* or receive a comparative meaning. There are proposals on the market for how to analyze the positive, the most prominent is to postulate a silent operator POS (cf. e.g. von Stechow 1984, Kennedy 2007)
- column "analytic tool(s)": By "standard" I mean that no specific analytical tools are necessary here, i.e. just the compositional rules by Heim & Kratzer (1998) enriched by degrees semantics.
- column "status": cf. Engl. = This analysis should work like in English with the difference that there is only a covert degree operator. ✓= analyzed in this thesis

[36] The percentage sign stands for the majority of the Nenets consultants that I worked with.

[37] This operator is probably overt, although I have not committed myself to this. It might also be a licensing relation between *-rka* in ConC and a covert comparative operator, cf. footnote 24 in section 4.3.4.

Summarizing the core part of Chapter 4, namely the analysis of comparatives with the suffix *-rka*, I have provided an analysis for Nenets that makes extensive use of the differential degree slot. In comparisons with an explicit standard, *-rka* modifies a degree slot that is already saturated by an existentially bound differential degree. This turned out to be non-trivial in terms of composition. I introduced the composition rule DR in the spirit of well-known principles RESTRICT or EI. What is being "incorporated" in these cases is a predicate of small degrees provided by the covert operator $\text{RKA}_{\text{abstract}}$. It is being incorporated into the degree predicate that is syntactically provided at this stage of composition. We are thus confirming **H3** repeated in (107).

(107) **H3**: Degree predicate modification in Nenets comparatives provides evidence for DEGREE RESTRICTION in natural language (similar to Event Identification by Kratzer 1996 and RESTRICT by Chung & Ladusaw 2004).

Taken altogether, I was able to resolve Puzzle 2, and partly resolve Puzzle 1 from the beginning of the chapter. Some puzzles still remain. One of them is the meaning of the unmarked form and the meaning of ConCs. I was able to provide a preliminary analysis of the ConC data with *-rka* by treating it as change in progress, i.e. *-rka* turning into a comparative marker. The other challenges have been addressed in Outlooks 1 and 2. In Outlook 1, I provided data where *-rka* is found on nouns, verbs and adverbs. A promising route to be pursued seems to be coerced gradability that we also find elsewhere, i.e. in metalinguistic comparisons (cf. Morzycki 2011), with the metalinguistic *-ish/..ish* in English (cf. R. Bochnak & Csipak 2014) and the hedge *sorta* (cf. Anderson 2013). Outlook 2 draws parallels to other elements that connect intensifiers that contribute an attenuative meaning with comparative operators, also a promising realm of future research.

What my analysis boils down to is exciting variation in the semantics of the differential degree, i.e. in the inventory of the functional lexicon. Differential comparatives are at the core of an analysis of Nenets. The signal morpheme that indicates the presence of a differential is *-rka*. In cases with an explicit standard of comparison, the suffix is appropriate if the difference in the provided gradable property is small between the two individuals, i.e. if they are not far away from each other on the scale provided by the gradable predicate. That means that we need a way to make the differential available in composition and modify it accordingly. Looking at the Table 4.5, the operator needed is almost always one that explicitly contains a differential degree as one of its arguments. Differential comparatives are at the center of attention in papers by Alrenga, Kennedy & Merchant (2012), Alrenga & Kennedy (2014). With my analysis I have also contributed

an interesting case to this debate.

Chapter 5

Concluding Remarks and Future Research

5.1 Variation and Processing in the Standard Argument

The standard argument in comparatives is directly connected to the the question of the type of comparative operator applied in degree semantics. In Chapter 2, I proposed the flowchart in 2.2 which works like a road map that can help a researcher decide what kind of comparative standard she is faced with and how to decide which kind of operator to use if the standard is genuinely phrasal. My specific focus was not on the distinction between the clausal and the phrasal operator, but on the two phrasal operators COMP_{Heim} and $\text{COMP}_{Kennedy}$. Previous research (especially Beck, Hohaus & Tiemann 2012) has already established that the only discernable difference between the two operators, namely the Schönfinkelization, matters. In this thesis, I was able to show that the crucial diagnostics to distinguish these two operators are DP-internal (INT) and DP-external (EXT) readings of attributive comparative operators. While INT can be derived with both operators, EXT requires parasitic movement which only COMP_{Heim} can undergo. The two crucial test cases for this were Russian and Nenets. Hypothesis **H1** that consists of the following three sub-hypotheses repeated in (1) could be confirmed.

(1) $\mathbf{H1_R}$: Genitive-marked synthetic comparatives in Russian use $\text{COMP}_{Kennedy}$.
$\mathbf{H1_N}$: Nenets uses COMP_{Heim}
$\mathbf{H1_G}$: German only has $\text{COMP}_{\text{clausal}}$

In Russian, genitive-marked comparatives were shown to only be compatible with $\text{COMP}_{Kennedy}$ thereby confirming $\mathbf{H1_R}$. Along with the scope diagnostics where I showed that genitive-marked comparatives in Russian lack scope ambiguities with attitude pred-

icates, INT vs. EXT were the crucial other diagnostics. In Nenets, the availability of EXT was the strongest argument in favor of COMP_{Heim}, supporting $\mathbf{H1_N}$. I was able to extend the cross-linguistic sample of comparative operators by adding Russian and Nenets, cf. Table 2.7. This provides answers to research question Q1, repeated in (2).

(2) **Q1**: What is the range of available degree operators cross-linguistically? In particular:
a. Do we see evidence for both phrasal operators described in the literature ($\text{COMP}_{Heim1985}$ and $\text{COMP}_{Kennedy1997}$)?
b. Or do we only need the stronger one ($\text{COMP}_{Heim1985}$) that covers a wider range of constructions?

Q1-a. can definitely be answered positively and Q1-b. negatively. We see evidence for $\text{COMP}_{Kennedy}$ which can be used to analyze a smaller set of constructions than COMP_{Heim}. This ties in nicely with research on English (Hohaus, Tiemann & Beck 2014) and Greek (Merchant 2009, Merchant 2012) in which Kennedy's phrasal operator was also suggested. In English, this conclusion is supported by evidence from L1-acquisition in German vs. English-speaking children. For Greek, Merchant proposes Kennedy's operator for *ap'oti*-clauses. Russian now provides additional evidence for the existence of $\text{COMP}_{Kennedy}$.

In Chapter 3, I investigated the processing of ambiguous German comparatives. Specifically, INT vs. EXT in German. In order to make predictions that are based on structural considerations, it was important to first establish that German has exclusively the clausal comparative operator, $\text{COMP}_{\text{clausal}}$. This was already done in Chapter 2, where I reviewed Lechner (2001,2004) and Bhatt & Takahashi (2011a,b) plus acquisitional evidence by Hohaus, Tiemann & Beck (2014) who all show that German only has $\text{COMP}_{\text{clausal}}$. This is a crucial prerequisite to be able to assign distinct LFs to the two readings. After this prerequisite was fulfilled, I could proceed to dealing with Q2 repeated in (3) and the corresponding hypothesis **H2** in (4).

(3) **Q2**: In processing, do we see complexity differences derived from the standard degree theory + predictions that arise from Hackl, Koster-Hale & Varvoutis (2012)?

Hypothesis **H2** repeated below could partly be confirmed.

(4) **H2**: According to the standard degree analysis and assumptions in Hackl, Koster-Hale & Varvoutis (2012) on individual quantifiers, attributive DP-external read-

ings of degree constructions in German are more complex than DP-internal reading, i.e. DP-external readings are harder to process than DP-internal readings.

I derived complexity differences between the two structures assigned to these two readings. The first and crucial complexity difference is the longer QR of the DegP in EXT when compared to INT. This is where I could establish a parallel to Hackl et al. (2012) who find evidence in favor of longer QR being costlier in processing than shorter QR. Hackl et al. (2012) showed this for quantifiers over individuals (type $\langle\langle e,t\rangle,t\rangle$). And I draw the parallel for quantifiers over degrees, where the DegP, which is QRed, is a generalized quantifier over degrees (type $\langle\langle d,t\rangle,t\rangle$). The second complexity difference is the size of the whole structure, as known from the Minimal Attachment Principle (Frazier & Fodor 1978; Frazier & Rayner 1982). Based on these complexity differences and Hackl et al. (2012), I made the predictions for INT vs. EXT that (i) EXT should be costlier than INT in processing (ii) and that INT should also be preferred to EXT. Pilot 2, the acceptability rating study, and the RT experiment that used preceding contexts lead us to suggest that the effect of context is very strong: it overlays any effect of structure so that the complexity differences cannot be detected. However, Pilot 1, a forced-choice study, and the eye-tracking experiment that did't use disambiguating context but a disambiguating continuation instead provide evidence that support the predictions. In Pilot 1, INT is preferred over EXT. In the eye-tracking experiment, there are significantly more eye regressions in the preview region for EXT than for INT providing support for **H2**. Thus, we can speak of a partial confirmation of **H2**. Altogether, this supports the quantificational analysis applied in this thesis and advances research on processing of degree-type quantifiers.

5.2 Variation in the Differential Argument

Chapter 4 of this dissertation was concerned with the semantics of the suffix *-rka* that is found on gradable adjective in comparative constructions is Nenets. Before proposing an analysis for *-rka*-marked comparatives, I first established that Nenets has gradable adjectives and degree abstraction, i.e. the parameter setting [+DSP], [+DAP] and [-DEGPP] according to Beck et al. (2009). I then proceeded to an analysis of Nenets comparative contstructions that do not involve the suffix *-rka* using Heim's phrasal operator (as established in section 2.3).

Why Chapter 4 is called "Variation in the Differential Argument of Comparatives" becomes clear in section 4.3 where I propose an analysis for Nenets comparatives con-

taining *-rka*. My analysis involves the modification of the differential argument. The differential argument is introduced by $\text{COMP}_{Heim_{\text{diff}}}$, a version of Heim's phrasal operator. $\text{RKA}_{\text{abstract}}$, which licenses the presence of *-rka* is given the meaning of a predicate of small degrees. It is thus analyzed as a degree modifier. In addition, I introduce the compositional principle DR in (61), Chapter 4, repeated in (5). I subsequently also briefly discussed in section 4.3.5 why a putative contender to my analysis, a presuppositional analysis of *-rka*, is unlikely and in no real competition with DR making a strong point in favor of my analysis.

(5) **Rule for Degree Restriction:**
If α is a branching node and $\{\beta, \gamma\}$ the set of its daughters, then for any assignment g, α is in the domain of $[\![\ ]\!]^g$ if both β and γ are, and β is of type $\langle d, t\rangle$ and γ is of type $\langle\langle d, \langle d, \langle e, t\rangle\rangle\rangle, \langle e, t\rangle\rangle$, then:
$[\![\alpha]\!]^g = \lambda d_d.\lambda R_{\langle d, \langle e, t\rangle\rangle}.\lambda x_e.\ [\![\gamma]\!]^g(d)(R)(x)=1 \wedge [\![\beta]\!]^g(d)=1.$

The proposed analysis confirms **H3** repeated in (6).

(6) **H3**: Degree predicate modification in Nenets comparatives provides evidence for Degree Restriction in natural language (similar to Event Identification by Kratzer 1996 and Restrict by Chung & Ladusaw 2004).

For the details of my analysis, I suggest consulting Table 4.5 in section 4.6 again where the reader has all the information at a glance.

Reflecting upon the role of DR, this principle finds itself in very good company with Event Identification in the domain of events and Restrict in the domain of individuals. In fact, this kind of operation also exists in the domain of times, type i. For instance, Hohaus (2019) calls it Extended Predicate Modification. She uses it to compose a noun with a relative clause. Her rule looks as follows:

(7) If α is a branching node and β and γ its daughters, $\beta \in D_{\langle i, \langle e, t\rangle\rangle}$ and $[\![\gamma]\!] \in D_{\langle e, t\rangle}$, then $[\![\alpha]\!] = \lambda t_{\langle i\rangle}.\lambda x._{\langle e\rangle}.[[\![\beta]\!](t)(x) = 1\ \&\ [\![\gamma]\!](x) = 1]$. (Hohaus 2019: 45, fn.2).

I am not aware of previous literature which finds this operation for the domain of degrees which makes my contribution unique and novel. I repeat the table that illustrates the parallels between the three operations below adding a line for times (due to Hohaus 2019).

	higher-type function f	lower-type function g	function after OPERATION: h
events	$\langle e, \langle v, t\rangle\rangle$	$\langle v, t\rangle$	$\langle e, \langle v, t\rangle\rangle$
individuals	$\langle e, \langle e, t\rangle\rangle$	$\langle e, t\rangle$	$\langle e, \langle e, t\rangle\rangle$
times	$\langle i, \langle e, t\rangle\rangle$	$\langle e, t\rangle$	$\langle i, \langle e, t\rangle\rangle$
degrees	$\langle d, \langle \alpha, t\rangle\rangle$	$\langle d, t\rangle$	$\langle d, \langle \alpha, t\rangle\rangle$

Table 5.1: Adding Degrees and Times to the Picture

I also want to draw a parallel to the Compositional Principle of Predicate Modification (PM). PM is a well-established composition rule that allows us to conjoin predicates of the same type, e.g. a structure like *black cat*, where *black* has type $\langle e, t\rangle$ and *cat* has this type, as well. However, by finding analogons to EI and RESTRICT for different semantic types in language after language, we are showing that PM needs to be more flexible or extendable to principles like DR where we conjoin two different types. Since it is available in different domains, this type of conjunction must then be a general part of natural languages, a generally available mechanism that is not just reserved for marginal phenomena.

In the bigger frame of things, this raises the question about the architecture of grammar, in particular the compositional rules that exist in compositional semantics. It is desirable to keep the inventory of compositional rules at a minimum (cf. the rules from Heim and Kratzer (1998) introduced in section 1.3.1 of the introductory Chapter 1). The established rules are Function Application, Predicate Abstraction and Predicate Modification. However, this might not suffice after all, as this thesis and its predecessors show. It cannot possibly be just an accident that researchers need this type of operation for different phenomena independently of each other. We might need this type of conjunction for all semantic types, as EVENT IDENTIFICATION in the domain of events (cf. Kratzer 1996), as RESTRICT in the domain of individuals (cf. Chung & Ladusaw 2004), Extended Predicate Modification in the domain of times (cf. Hohaus 2019) and, finally, DEGREE RESTRICT in the domain of degrees.

5.3 Directions for Future Research

In this dissertation I uncovered systematic variation both in the standard and the differential argument of the comparative. I thereby contributed to the following research areas: the inventory of comparative operators cross-linguistically and degree modification. These areas are intertwined: Depending on the marking of the standard (phrasal

or clausal), the operator differs. The analysis of ambiguous attributive comparatives also depends on the analysis of the standard. In conclusion, I want to briefly address two directions for future research, namely (i) non-degree uses of expressions like *-rka and* (ii) the availability and scope of Degree Restrict.

(i) A highly interesting research perspective opened up in this thesis by the investigation of *-rka* is the analysis of this morpheme outside of comparatives. The data and observations described in Outlook 1, section 4.4, require an explanation. Ideally, a unified analysis is called for *-rka* outside of comparatives. The analysis needs to take into account *-rka*'s cross-categorial nature and, clearly, the meaning it adopts depending on which category it is put on. In comparatives, *-rka* is analyzed as a degree modifier. A promising path for degree modifiers like *-rka* outside of comparatives is offered by recent literature on coerced gradability and degrees of (im)precision (cf. Morzycki (2011) and used by Anderson (2013) and R. Bochnak & Csipak (2014)). Conjecturally, if *-rka* is a modifier of degrees in comparatives, it might be a modifier of degrees of precision outside of comparatives. Crucially, it seems clear that *-rka* is the element that imposes some kind of gradability to even traditionally non-gradable domains. Hence the relation to questions posed in the introduction to this thesis: Are degrees confined to the domain of degree constructions? Can scalarity be exported to domains of grammar which at first glance do not seem to be scalable? Intuitively, elements like *-rka* impose scalarity on elements they modify. In other words, they come with a scale which can be a scale of degrees, or else, a different type of scale, like a scale of precision. Therefore, the scalarity does not come from the traditionally non-scalable domains, but rather from hedges like *-rka*. I think that these exciting questions deserve further attention from semanticists.

(ii) Let us remember the questions that were already raised in section 4.3.5.1 on the bearing of Degree Restrict: Is Restriction a mode of composition that human language has in every domain, i.e. the domain of individuals, events, times, degrees etc.? If yes, where is it available and which restrictions is it subject to concerning cross-linguistic variation? We have seen that what is interesting about DR is not so much that it solves an immediate composition problem, but that there might be a global grammatical generalization that motivates it. The motivation for RESTRICT comes, among other things, from noun incorporation, which is a mode of composition whose availability and exact nature varies between languages. Parallel questions can be asked in the area of constructions involving events, times, but also degree constructions. It is worth while looking further into languages like Japanese and Turkish, or also Chinese and Bulgarian from Outlook 2 in section 4.5 which have morphemes similar to *-rka*, i.e. that show up in comparatives, but are not themselves the comparative operator. Taking this idea fur-

ther, the question arises of whether those languages combine an overt difference degree with those morphemes, in other words, what the circumstances are under which DR can apply, a question that has been raised and elaborated on in section 4.3.5.1. Systematic cross-linguistic investigations can shed light on these questions in future research.

Concluding, I want to point out that the discovery of DR came by investigation of a tiny morpheme *-rka* in Nenets! This shows how fieldwork on threatened, under-represented and not well documented languages can provide valuable insights for theory building. What we learn from close examination of *-rka* is that taking the idiosyncrasies of any given language seriously is very important and fruitful. At this point, I once again want to vouch for a strong empirical perspective in any theoretically-driven enterprise: as long as our theory building is centered around selected, mostly Indo-European languages, we cannot claim enough universality and strength for our theory. But the more the hypotheses arising from our theory withstand the challenge of different types of data like experimental, diachronic, as well as fieldwork data from languages that are not genetically related, the more we can pat ourselves on the shoulder and be sure to be moving in the right direction.

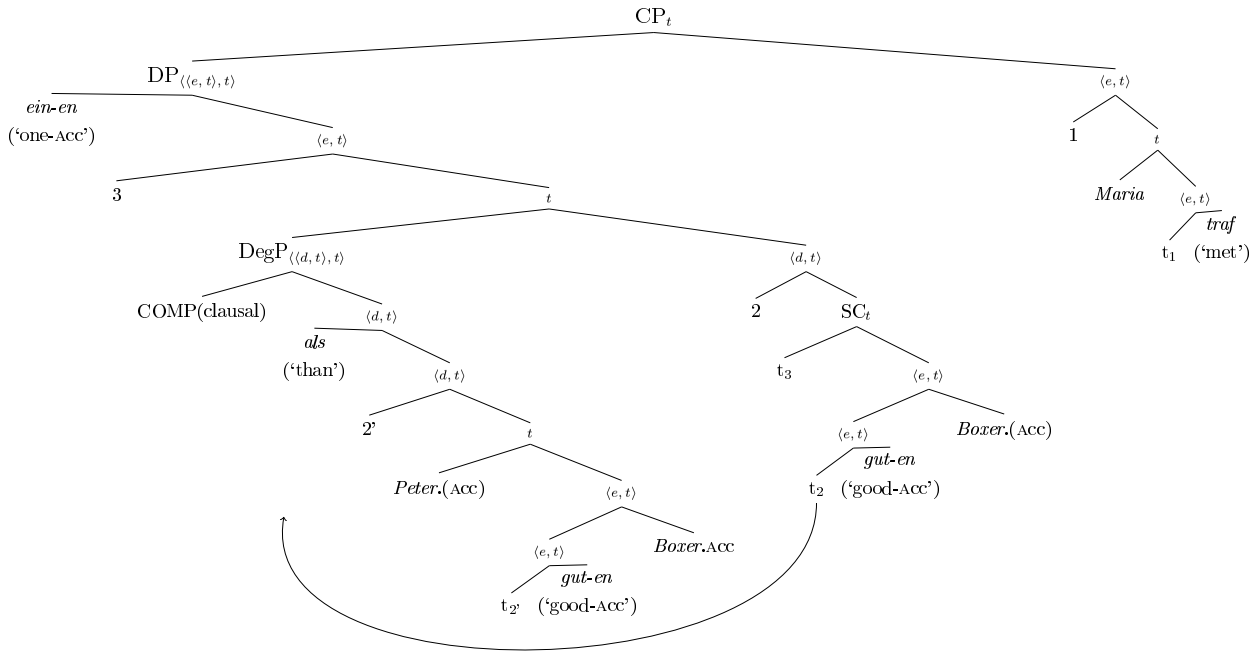
Appendices

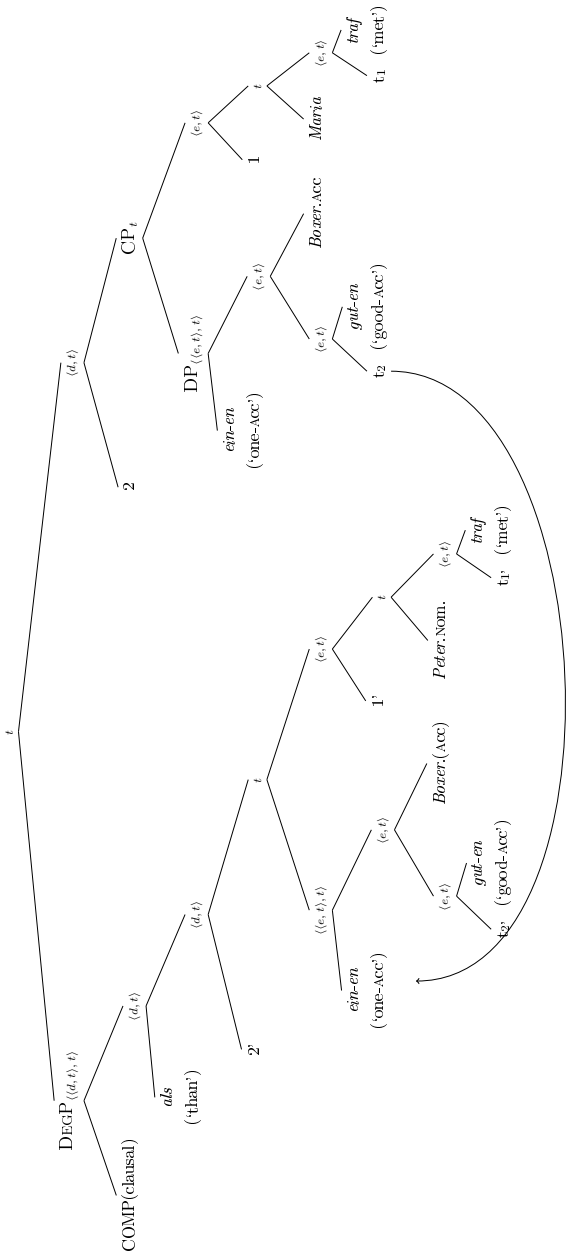
Appendix A

LFs for Int and Ext

The two LFs for the two readings of the sentence in (1) from Chapter 3 (*Maria traf einen besseren Boxer als Peter.*) can be found on the following two pages.

From Chapter 3: LF for INT of the sentence *Maria traf einen besseren Boxer als Peter.*





From Chapter 3: LF for EXT of the sentence *Maria traf einen besseren Boxer als Peter.*

Appendix B

Experimental Items for Experiments 1, 2 and 3

1. Peter traf eine stärkere Boxerin als Julia und darüber freut er sich.
   'Peter met a stronger boxer than Julia and he is happy about that.'
   a. **Ext/+Match**: Gestern erzählte Julia ihrem Kumpel Peter, sie habe sich mit einer Freundin getroffen, die für 5 Knockouts verantwortlich war. Peter erinnerte sich, dass eine Boxerin, die er neulich getroffen hat, sogar schon 7 Knockouts verzeichnen konnte.
   b. **Ext/−Match**: Gestern erzählte Julia ihrem Kumpel Peter, sie habe sich mit einer Freundin getroffen, die für ganze 9 Knockouts verantwortlich war. Peter erinnerte sich, dass die beste Boxerin, die er bis jetzt getroffen hat, lediglich 5 Boxkämpfe mit einem Knockout gewonnen hat.
   c. **Int/+Match**: Gestern prahlte Julia vor ihrem Kumpel Peter, sie habe 5 Boxkämpfe mit einem Knockout gewonnen. Peter erinnerte sich, dass eine Boxerin, die er neulich getroffen hat, bis jetzt sogar schon 9 Boxkämpfe durch ein Knockout gewonnen hat.
   d. **Int/−Match**: Gestern prahlte Julia vor ihrem Kumpel Peter, sie habe schon 9 Boxkämpfe mit einem Knockout gewonnen. Peter erinnerte sich, dass die stärkste Boxerin, die er je getroffen hat, bis jetzt nur 5 Boxkämpfe gewonnen hat.

2. Martin besuchte eine lautere Sängering als Sarah und fand das schön.
   'Martin visited a louder singer than Sarah and he liked that.'
   a. **Ext/+Match**: Martin ist auf der Suche nach einer talentierten Sängerin mit einer lauten Stimme. Letzte Woche stattete Martin einer Sängerin einen Besuch ab, die eine sehr laute Stimme hat. Seine Kollegin Sarah war zum Kaffeetrinken bei einer Freundin, die ebenfalls Sängerin ist, aber wesentlich leiser singt.
   b. **Ext/−Match**: Martin ist auf der Suche nach einer talentierten Sängerin mit

einer lauten Stimme. Letzte Woche besuchte er eine Sängerin, die eine relativ laute Stimme hat. Seine Bekannte Sarah war zum Kaffeetrinken bei einer Freundin, die ebenfalls Sängerin ist und wesentlich lauter singen kann.

c. **Int/+Match**: Letzte Woche stattete Martin einer Sängerin einen Besuch ab, die eine sehr laute Stimme hat. Selbst seine Bekannte Sarah, ebenfalls Sängerin von Beruf, singt leiser.

d. **Int/−Match**: Letzte Woche stattete Martin einer Sängerin einen Besuch ab, die eine relativ laute Stimme hat. Seine Bekannte Sarah, ebenfalls Sängerin von Beruf, kann allerdings wesentlich lauter singen.

3. Sandra stellte einen klügeren Mitarbeiter ein als Dennis und damit war sie zufrieden.
'Sandra hired a smarter employee than Dennis and she was satisfied with that.'

a. **Ext/+Match**: Seit zwei Wochen ist in Sandras Firma eine Stelle neu besetzt. Sie wählte einen überdurchschnittlich klugen Mitarbeiter. Auch ihr Bekannter Dennis stellte einen neuen Mitarbeiter ein, der bei dem zu absolvierenden IQ-Test allerdings wesentlich schlechter abschnitt.

b. **Ext/−Match**: Seit zwei Wochen ist in Sandras Firma eine Stelle neu besetzt. Sie wählte einen Mitarbeiter, der bei dem zu absolvierenden IQ-Test relativ schlechte Ergebnisse erbrachte. Ihr Bekannter Dennis hingegen stellte einen neuen Mitarbeiter ein, der den IQ-Test mit wesentlich besseren Ergebnissen absolvierte.

c. **Int/+Match**: Seit zwei Wochen ist in Sandras Firma eine Stelle neu besetzt. Sie wählte einen überdurchschnittlich klugen Mitarbeiter. Dennis, ein anderer Mitarbeiter in ihrer Firma, erbrachte bei dem zu absolvierenden IQ-Test wesentlich schlechtere Leistungen.

d. **Int/−Match**: Seit zwei Wochen ist in Sandras Firma eine Stelle neu besetzt. Sie wählte einen relativ klugen Mitarbeiter. Dennis, ein anderer Mitarbeiter in ihrer Firma, erbrachte bei dem zu absolvierenden IQ-Test jedoch wesentlich bessere Leistungen.

4. Sascha fotografierte ein schöneres Model als Marie und davon war er überwältigt.
'Sascha photographed a prettier model than Marie and he was overwhelmed by that.'

a. **Ext/+Match**: In seinem letzten Fotoshooting stand für Sascha ein außergewöhnlich schönes Model vor der Kamera. Nicht mal seine Kollegin Marie hatte jemals so eine Schönheit fotografiert.

b. **Ext/−Match**: In seiner Karriere als Fotograf standen für Sascha schon einige schöne Models vor der Kamera. Seine Kollegin Marie fotografierte neulich allerd-

ings ein Model von solcher Schönheit, dass sie seine Modelle bei weitem übertraf.
c. **Int/+Match**: In seinem letzten Fotoshooting stand für Sascha ein außergewöhnlich schönes Model vor der Kamera. Nicht mal Marie, eine seiner anderen Models, kam an ihre Schönheit heran.
d. **Int/−Match**: In seinem letzten Fotoshooting stand für Sascha ein durchschnittlich schönes Model vor der Kamera. Marie jedoch, ein anderes Model, war wesentlich schöner.

5. Anne lobte einen erfolgreicheren Unternehmer als Philipp und fand das gerechtfertigt.
'Anne praised a more successful businessman than Philipp and she found that justified.'
a. **Ext/+Match**: Neulich sprach Anne einem Unternehmer, den sie aufgrund seiner außerordentlichen Erfolge bewundert, ihre Anerkennung aus. Philipp lobte seinerseits einen anderen sehr sozialen, aber weniger erfolgreichen Unternehmer.
b. **Ext/−Match**: Neulich sprach Anne einem nicht sehr erfolgreichen, allerdings sozial sehr engagierten Unternehmer, ihre Anerkennung aus. Philipp hingegen lobte einen Unternehmer, der seiner Firma schon viele Erfolge und großen Umsatz eingebracht hat.
c. **Int/+Match**: Neulich sprach Anne einem Unternehmer, den sie aufgrund seiner außerordentlichen Erfolge bewundert, ihre Anerkennung aus. Dieser hatte in den letzten Jahren wesentlich mehr Umsatz gemacht als ihr guter Bekannter Philipp, der sich als Unternehmer versucht.
d. **Int/−Match**: Neulich sprach Anne ihrem Bekannten Philipp, den sie aufgrund seiner außerordentlichen Erfolge bewundert, ihre Anerkennung aus. Dieser hatte in den letzten Jahren wesentlich mehr Umsatz gemacht als ein anderer guter Bekannter von ihr, der sich ebenfalls als Unternehmer versucht.

6. Katrin unterstützte einen besseren Schüler als Daniel und davon war sie überzeugt.
'Katrin supported a better student than Daniel and she was convinced of that.'
a. **Ext/+Match**: Für den Mathewettbewerb an der Schule meinte Katrin, man solle einen Schüler teilnehmen lassen, der sehr gute Noten in Mathe hat. Ihr Kollege Daniel unterstütze allerdings einen Schüler seiner Klasse, der zwar schlechte Zensuren erbringt, aber schon Erfahrung bei Wettbewerben gesammelt hat.
b. **Ext/−Match**: Für den Mathewettbewerb an der Schule meinte Katrin, man solle einen Schüler teilnehmen lassen, der nicht die besten Noten in Mathe habe, um ihm die Chance zu geben, sich zu verbessern. Ihr Kollege Daniel meinte allerdings,

man solle lieber einen Schüler seiner Klasse nehmen, der bessere Noten hat.

c. **Int/+Match**: Für den Mathewettbewerb an der Schule meinte Katrin, man solle den Klassenbesten nehmen. Ein anderer Schüler, Daniel, der schon Erfahrung bei Wettbewerben gesammelt hat, jedoch keine guten Noten hatte, wurde nicht ausgewählt.

d. **Int/−Match**: Für den Mathewettbewerb schlug Katrin einen Schüler vor, der immer schlechte Noten hat. Daniel, der Klassenbeste, wurde hingegen nicht unterstützt.

7. Stephan joggte mit einer schnelleren Läuferin als Nina und das forderte ihn heraus.
'Stephan ran with a faster runner than Nina and that was a challenge for him.'

a. **Ext/+Match**: Neulich joggte Stephan mit einer Freundin, die sehr schnell läuft. Nina lief auch eine kleine Runde mit einer Freundin, die allerdings nur sehr langsam vorankam.

b. **Ext/−Match**: Neulich joggte Stephan mit einer Freundin, die immer sehr langsam läuft. Nina lief auch eine kleine Runde mit einer Freundin, die allerdings einen sehr schnellen Schritt hatte.

c. **Int/+Match**: Neulich joggte Stephan mit einer Freundin, die sehr schnell läuft. Ihm fiel auf, dass seine Freundin Nina, mit der er sonst joggt, wesentlich langsamer ist.

d. **Int/−Match**: Neulich joggte Stephan mit einer Freundin, die sehr langsam läuft. Ihm fiel auf, dass seine Freundin Nina, mit der er sonst joggt, wesentlich schneller ist.

8. Thomas umarmte eine größere Frau als Christin und das fand er ungewohnt.
'Thomas hugged a taller woman than Christin and he found that strange.'

a. **Ext/+Match**: Beim letzten Kinoabend umarmte Thomas zur Begrüßung eine Freundin, die sehr groß ist. Christin nahm eine andere Freundin in den Arm, die im Freundeskreis eine der kleineren ist.

b. **Ext/−Match**: Beim letzten Kinoabend umarmte Thomas zur Begrüßung eine Freundin, die im Freundeskreis von allen die Kleinste ist. Christin umarmte eine andere Freundin, die sehr groß ist.

c. **Int/+Match**: Beim letzten Kinoabend umarmte Thomas zur Begrüßung eine Freundin, die außergewöhnlich groß ist. Seine Freundin Christin ist wesentlich kleiner.

d. **Int/−Match**: Beim letzten Kinoabend umarmte Thomas zur Begrüßung eine Freundin, die von sehr kleiner Statur ist. Seine Freundin Christin ist wesentlich

größer.

9. Katja suchte einen geschickteren Handwerker als Markus und das fand sie gerechtfertigt.
   'Katja searched for a more skillful craftsman than Markus and she found that justified.'
   a. **Ext/+Match**: Wegen ihrer kaputten Waschmaschine suchte Katja dringend einen Handwerker, der mit Waschmaschinen sehr gut umgehen konnte. Ihr Freund Markus allerdings legte nicht viel Wert auf Geschicklichkeit und schaute nach einem mittelmäßigen, aber günstigeren Handwerker.
   b. **Ext/−Match**: Seit einiger Zeit war Katjas Waschmaschine kaputt. Deshalb suchte sie nach einem Handwerker, der vor allem günstig sein sollte. Ihr Freund Markus allerdings legte sehr viel Wert auf Geschicklichkeit und schaute nach einem sehr guten Handwerker.
   c. **Int/+Match**: Seit einiger Zeit war Katjas Waschmaschine kaputt. Deshalb legte sie bei der Suche nach einem Handwerker großen Wert auf Geschicklichkeit. Sie wusste gleich, dass ihr Freund Markus sich dafür nicht eignen würde, da es ihm daran mangelte.
   d. **Int/−Match**: Seit einiger Zeit war Katjas Waschmaschine kaputt. Deshalb suchte sie nach einem Handwerker, der vor allem günstig sein sollte. Ihr Bekannter Markus war zwar sehr geschickt, aber viel zu teuer für ihre Verhältnisse.

10. Christoph telefonierte mit einer lustigeren Beraterin als Lena und darüber freute er sich.
    'Christoph called a funnier consultant than Lena and he was happy about that.'
    a. **Ext/+Match**: Letzte Woche hatte Christoph ein telefonisches Beratungsgespräch mit seiner Versicherung. Seine Beraterin machte immer wieder Witze und es wurde ein sehr unterhaltsames Telefongespräch. Seine Freundin Lena erzählte ihm, dass sie auch ein Beratungsgespräch hatte, ihre Beraterin allerdings sehr sachlich gewesen sei.
    b. **Ext/−Match**: Letzte Woche hatte Christoph ein telefonisches Beratungsgespräch mit seiner Versicherung, wobei seine Beraterin sehr sachlich blieb. Seine Freundin Lena erzählte ihm, dass sie auch ein Beratungsgespräch hatte, welches sehr unterhaltsam gewesen sei, da ihre Beraterin immer wieder Witze gemacht habe.
    c. **Int/+Match**: Letzte Woche hatte Christoph ein telefonisches Beratungsgespräch mit seiner Versicherung. Seine Beraterin machte immer wieder Witze und

es wurde ein sehr unterhaltsames Telefongespräch. Lena, die ihn normalerweise beriet, war dagegen ein sehr sachlicher Mensch.

d. **Int/−Match**: Letzte Woche hatte Christoph ein telefonisches Beratungsgespräch mit seiner Versicherung. Seine Beraterin verhielt sich dabei sehr sachlich. Lena, die ihn normalerweise beriet, hatte im Gegensatz dazu immer Witze gemacht.

11. Robert holte eine fröhlichere Kollegin ab als Svenja und darüber war er erleichtert.
'Robert picked up a happier colleague than Svenja and he was relieved about that.'

a. **Ext/+Match**: Letzten Dienstag kam Roberts Kollegin von einer Geschäftsreise zurück und er holte sie vom Flughafen ab. Aufgrund eines großen Erfolgs war sie sehr gut gelaunt. Svenja holte auch eine Kollegin ab, die jedoch aufgrund von einem geplatzten Deal sehr traurig war.

b. **Ext/−Match**: Letzten Dienstag kam Roberts Kollegin von einer Geschäftsreise zurück und er holte sie vom Flughafen ab. Aufgrund von Misserfolgen war sie sehr traurig. Svenja holte auch eine Kollegin ab, die aufgrund eines großen Erfolgs sehr gut gelaunt war.

c. **Int/+Match**: Letzten Dienstag kam Roberts Kollegin von einer Geschäftsreise zurück und er holte sie vom Flughafen ab. Aufgrund eines großen Erfolgs war sie sehr gut gelaunt. Im Gegensatz dazu war seine andere Kollegin Svenja, die er ebenfalls abholte, sehr traurig, da sie einige Misserfolge verzeichnen musste.

d. **Int/−Match**: Letzten Dienstag kam Roberts Kollegin von einer Geschäftsreise zurück und er holte sie vom Flughafen ab. Aufgrund einiger Misserfolge war sie sehr traurig. Im Gegensatz dazu war seine Kollegin Svenja, die er ebenfalls abholte, sehr gut gelaunt, da sie große Erfolge verzeichnen konnte.

12. Anja kündigte einem fleißigeren Mitarbeiter als Marcel und das machte ihr zu schaffen.
'Anja dismissed a more diligent employee than Marcel and that bothered her.'

a. **Ext/+Match**: Letzte Woche kündigte Anja einem Mitarbeiter, der fleißig, aber noch zu unerfahren für den Job war. Marcel kündigte ebenfalls einem Mitarbeiter, der allerdings nicht so motiviert und fleißig war.

b. **Ext/−Match**: Letzte Woche kündigte Anja einem Mitarbeiter, da dieser nicht so fleißig war. Marcel kündigte ebenfalls einem Mitarbeiter, der sehr fleißig, aber zu unerfahren für den Job war.

c. **Int/+Match**: Letzte Woche kündigte Anja einem Mitarbeiter, der sehr fleißig, aber noch zu unerfahren für den Job war. Marcel, ein anderer Mitarbeiter, war dagegen nicht so motiviert und fleißig.

d. **Int/−Match**: Letzte Woche kündigte Anja einem Mitarbeiter, da dieser nicht sehr fleißig war. Marcel, ein anderer Mitarbeiter, war dagegen sehr motiviert und fleißig.

13. Maike bestrafte einen frecheren Schüler als David und mit ihrer Entscheidung war sie zufrieden.
'Maike punished a sassier student than David and she was satisfied with that decision.'
a. **Ext/+Match**: Am Montagmorgen verhielt sich einer von Maikes Schülern derartig frech, dass sie ihm eine Strafarbeit gab. Ihr Kollege David vergab auch eine Strafarbeit an einen Schüler, der aber wesentlich weniger frech war.
b. **Ext/−Match**: Am Montagmorgen verhielt sich einer von Maikes Schülern wenig auffällig und trotzdem erteilte sie ihm eine Strafarbeit. Ihr Kollege David vergab auch eine Strafarbeit an einen Schüler, der sich aber wesentlich frecher verhalten hatte.
c. **Int/+Match**: Am Montagmorgen verhielt sich einer von Maikes Schülern derartig frech, dass sie ihm eine Strafarbeit erteilte. Im Gegensatz dazu war David ein sehr braver Schüler.
d. **Int/−Match**: Am Montagmorgen verhielt sich einer von Maikes Schülern wenig auffällig und trotzdem gab sie ihm eine Strafarbeit. David, ein anderer Schüler verhielt sich hingegen sehr frech, aber bekam trotzdem keine Strafarbeit.

14. Tanja beriet einen freundlicheren Klienten als Simon und damit war sie zufrieden.
'Tanja advised a friendlier client than Simon and she was satisfied with that.'
a. **Ext/+Match**: Neulich hatte Tanja ein Beratungsgespräch mit einem sehr freundlichen Klienten. Ihr Kollege Simon beriet auch einen Klienten, der sich allerdings sehr unfreundlich ihm gegenüber verhielt.
b. **Ext/−Match**: Neulich hatte Tanja ein Beratungsgespräch mit einem sehr unfreundlichen Klienten. Ihr Kollege Simon beriet auch einen Klienten, der sich allerdings sehr freundlich ihm gegenüber verhielt.
c. **Int/+Match**: Neulich hatte Tanja ein Beratungsgespräch mit einem sehr freundlichen Klienten. Simon, ein anderer Klient von ihr, war wesentlich unfreundlicher zu ihr.
d. **Int/−Match**: Neulich hatte Tanja ein Beratungsgespräch mit einem sehr unfreundlichen Klienten. Simon, ein anderer Klient von ihr, verhielt sich immer wesentlich freundlicher ihr gegenüber.

15. Kerstin meldete einen aggressiveren Spieler als Thorsten und das fand sie fair.

'Kerstin reported a more aggressive player than Thorsten and she found that just.'
a. **Ext/+Match**: Beim letzten Fußballspiel meldete Kerstin einen Spieler, der sehr aggressiv war. Thorsten meldete auch einen Spieler, obwohl dieser weniger aggressiv gespielt hatte.
b. **Ext/−Match**: Beim letzten Fußballspiel meldete Kerstin einen Spieler, der nicht besonders aggressiv gespielt, aber dennoch die Regeln verletzt hatte. Thorsten meldete auch einen Spieler, der hingegen wesentlich aggressiver gespielt hatte.
c. **Int/+Match**: Beim letzten Fußballspiel meldete Kerstin einen Spieler, der sehr aggressiv war. Thorsten, ein anderer Spieler, passte sich an und spielte wesentlich weniger aggressiv.
d. **Int/−Match**: Beim letzten Fußballspiel meldete Kerstin einen Spieler, der nicht besonders aggressiv gespielt, aber dennoch die Regeln verletzt hatte. Thorsten, ein anderer Spieler, spielte dagegen sehr aggressiv.

16. Tobias beschenkte eine anspruchsvollere Kollegin als Yvonne und damit tat er sich schwer.
'Tobias gave presents to a more demanding colleague than Yvonne and he struggled with that.'
a. **Ext/+Match**: Beim letzten Weihnachtswichteln musste Tobias eine Kollegin beschenken, die sehr anspruchsvoll war. Seine Freundin Yvonne hatte es mit dem Geschenk bei ihrer wenig anspruchsvollen Kollegin eher leicht.
b. **Ext/−Match**: Beim letzten Weihnachtswichteln durfte Tobias eine Kollegin beschenken, die wenig Ansprüche hatte. Seine Freundin Yvonne hingegen musste einer sehr anspruchsvollen Kollegin ein Geschenk besorgen.
c. **Int/+Match**: Beim letzten Weihnachtswichteln musste Tobias eine Kollegin beschenken, die sehr anspruchsvoll war. Yvonne, eine andere Kollegin, war dagegen viel einfacher zufriedenzustellen.
d. **Int/−Match**: Beim letzten Weihnachtswichteln durfte Tobias eine Kollegin beschenken, die einfach zufriedenzustellen war. Yvonne, eine andere Kollegin, war dagegen sehr anspruchsvoll.

17. Christian befragte eine ehrlichere Passantin als Tina und das gab ihm Mut.
'Christian questioned a more honest passerby than Tina and that gave him courage.'
a. **Ext/+Match**: Gestern befragte Christian im Rahmen einer Umfrage eine Passantin, die sich sehr ehrlich äußerte. Seine Freundin Tina allerdings befragte eine Passantin, die auffallend unehrlich auf die Fragen antwortete.
b. **Ext/−Match**: Gestern befragte Christian im Rahmen einer Umfrage eine

Passantin, die auffallend unehrlich auf seine Fragen antwortete. Seine Freundin Tina allerdings befragte eine Passantin, die sich sehr ehrlich äußerte.

c. **Int/+Match**: Gestern befragte Christian im Rahmen einer Umfrage eine Passantin, die sich sehr ehrlich äußerte. Tina, eine andere Passantin, beantwortete seine Fragen hingegen auffallend unehrlich.

d. **Int/−Match**: Gestern befragte Christian im Rahmen einer Umfrage eine Passantin, die auffallend unehrlich auf seine Fragen antwortete. Tina, eine andere Passantin, äußerte sich hingegen sehr ehrlich.

18. Lisa bediente einen arroganteren Geschäftsmann als Michael und darüber ärgerte sie sich.

    'Lisa served a more arrogant businessman than Michael and that irritated her.'

    a. **Ext/+Match**: Letzte Woche bediente Lisa einen Geschäftsmann, der sie äußerst arrogant behandelte. Ihr Kollege Michael hingegen bediente einen Geschäftsmann, der sich nicht so arrogant verhielt.

    b. **Ext/−Match**: Letzte Woche bediente Lisa einen Geschäftsmann, der nicht arrogant wirkte. Ihr Kollege Michael hingegen bediente einen Geschäftsmann, der sich äußert arrogant benahm.

    c. **Int/+Match**: Letzte Woche bediente Lisa einen Geschäftsmann, der sie äußerst arrogant behandelte. Michael, ein anderer Geschäftsmann, benahm sich nicht so arrogant.

    d. **Int/−Match**: Letzte Woche bediente Lisa einen Geschäftsmann, der nicht arrogant wirkte. Michael, ein anderer Geschäftsmann, war dagegen sehr arrogant.

19. Antje belohnte einen motivierteren Teilnehmer als Florian und darüber freute sie sich.

    'Antje rewarded a more motivated participant than Florian and she was happy about that.'

    a. **Ext/+Match**: Beim letzten Team-Training belohnte Antje einen sehr motivierten Teilnehmer mit einer Prämie. Ihr Bekannter Florian belohnte auch einen Teilnehmer seiner Arbeitsgruppe, obwohl dieser eindeutig wenig motiviert war.

    b. **Ext/−Match**: Beim letzten Team-Training belohnte Antje einen Teilnehmer, der überhaupt nicht motiviert war. Ihr Bekannter Florian belohnte auch einen Teilnehmer seiner Arbeitsgruppe, der allerdings sehr motiviert war.

    c. **Int/+Match**: Beim letzten Team-Training belohnte Antje einen sehr motivierten Teilnehmer. Florian, ein anderer Teilnehmer der Arbeitsgruppe, war im Vergleich dazu nicht so motiviert.

d. **Int/−Match**: Beim letzten Team-Training belohnte Antje einen Teilnehmer, der überhaupt nicht motiviert war. Florian, ein anderer Teilnehmer der Arbeitsgruppe, war hingegen sehr motiviert.

20. Bianca behandelte einen empfindlicheren Patienten als Manuel und fand das sehr anstrengend.
'Bianca treated a more sensitive patient than Manuel and she found that very strenuous.'
a. **Ext/+Match**: Die letzten zwei Monate behandelte Bianca einen Patienten, der sehr empfindlich war. Ihr Kollege Manuel hingegen behandelte einen Patienten, der härter im Nehmen war und verschiedene Behandlungen mutig über sich ergehen ließ.
b. **Ext/−Match**: Die letzten zwei Monate behandelte Bianca einen Patienten, der sehr unkompliziert und nicht so empfindlich war. Ihr Kollege Manuel hingegen behandelte einen Patienten, der sehr empfindlich auf alles reagierte.
c. **Int/+Match**: Die letzten zwei Monate behandelte Bianca einen Patienten, der sehr empfindlich war. Manuel, sein Zimmernachbar, war wesentlich härter im Nehmen.
d. **Int/−Match**: Die letzten zwei Monate behandelte Bianca einen Patienten, der sehr unkompliziert und nicht sehr empfindlich war. Manuel, sein Zimmernachbar, war hingegen sehr wehleidig und empfindlich.

21. Janine half einem kompetenteren Praktikanten als Rene und darüber war sie froh.
'Janine helped a more competent intern than Rene and she was glad about that.'
a. **Ext/+Match**: Gestern half Janine einem Praktikanten, der sehr kompetent war. Ihr Kollege Rene half auch einem Praktikanten, obwohl dieser nicht so fleißig und kompetent war.
b. **Ext/−Match**: Gestern half Janine einem Praktikanten, der überhaupt nicht kompetent war. Ihr Kollege Rene half auch einem Praktikanten, der dagegen sehr kompetent und fleißig war.
c. **Int/+Match**: Gestern half Janine einem Praktikanten, der sehr kompetent war. Rene, ein anderer Praktikant, war dagegen nicht so fleißig und kompetent.
d. **Int/−Match**: Gestern half Janine einem Praktikanten, der überhaupt nicht kompetent war. Rene, ein anderer Praktikant, war dagegen sehr kompetent.

22. Lea besiegte einen angeseheneren Spieler als Yannik und darauf war sie stolz.
'Lea defeated a more reputable player than Yannik and she was proud of that.'
a. **Ext/+Match**: Beim Tennisturnier besiegte Lea einen sehr angesehenen

Spieler. Ihr Freund Yannik besiegte auch einen Spieler, der allerdings auch kein so großes Ansehen genoss.

b. **Ext/−Match**: Beim Tennisturnier besiegte Lea einen Spieler, der sehr wenig Ansehen genoss. Ihr Freund Yannik besiegte einen Spieler, der allerdings sehr großes Ansehen in der Tenniswelt hatte.

c. **Int/+Match**: Beim Tennisturnier besiegte Lea einen sehr angesehenen Spieler. Yannik, ein anderer Spieler, ist hingegen viel weniger angesehen.

d. **Int/−Match**: Beim Tennisturnier besiegte Lea einen Spieler, der sehr wenig Ansehen in der Tenniswelt genoss. Yannik, ein anderer Spieler, besaß dagegen sehr großes Ansehen.

23. Jasmin rasierte einen großzügigeren Kunden als Felix und war darüber froh.
'Jasmin shaved a more generous customer than Felix and she was glad about that.'

a. **Ext/+Match**: Gestern rasierte Jasmin in ihrem Frisörsalon einen sehr großzügigen Kunden, der nicht mit dem Trinkgeld geizte. Ihr Kollege Felix hingegen rasierte einen Kunden, der ihm überhaupt kein Trinkgeld gab.

b. **Ext/−Match**: Gestern rasierte Jasmin in ihrem Frisörsalon einen sehr geizigen Kunden, der ihr überhaupt kein Trinkgeld gab. Ihr Kollege Felix hingegen rasierte einen sehr großzügigen Kunden, der nicht mit dem Trinkgeld geizte.

c. **Int/+Match**: Gestern rasierte Jasmin in ihrem Frisörsalon einen sehr großzügigen Kunden, der nicht mit dem Trinkgeld geizte. Felix, ein anderer Kunde von ihr, gab ihr hingegen überhaupt kein Trinkgeld.

d. **Int/−Match**: Gestern rasierte Jasmin in ihrem Frisörsalon einen sehr geizigen Kunden, der ihr überhaupt kein Trinkgeld gab. Felix, ein anderer Kunde von ihr hingegen war immer sehr großzügig und geizte nicht mit dem Trinkgeld.

24. Julian unterrichtete eine aufmerksamere Schülerin als Denise und das fiel ihm leicht.
'Julian taught a more attentive student than Denise and that was easy for him.'

a. **Ext/+Match**: Letzte Woche unterrichtete Julian eine Schülerin, die sehr aufmerksam war. Seine Kollegin Denise hingegen unterrichtete eine Schülerin, die viel weniger konzentriert zuhörte.

b. **Ext/−Match**: Letzte Woche unterrichtete Julian eine Schülerin, die ihm überhaupt keine Aufmerksamkeit schenkte. Seine Kollegin Denise hingegen unterrichtete eine Schülerin, die sehr aufmerksam war.

c. **Int/+Match**: Letzte Woche unterrichtete Julian eine Schülerin, die sehr aufmerksam war. Denise, eine andere Schülerin, hörte viel weniger konzentriert zu.

d. **Int/−Match**: Letzte Woche unterrichtete Julian eine Schülerin, die ihm überhaupt keine Aufmerksamkeit schenkte. Denise, eine andere Schülerin, war hingegen sehr aufmerksam.

Appendix C

Eye-Tracking Experiment

C.1 Experimental Items

1. a. **Nom (target) = Int**: Peter*traf*einen stärkeren Boxer*als*Julian*einer ist. *Peters*Boxer*hatte*unheimlich schnelle*Reflexe.
   b. **Nom (control)**: Peter*traf*einen starken Boxer*und*schickte sogleich ein Video an*Julian,*der*auch*einer ist.*Peters*Boxer*hatte*unheimlich schnelle* Reflexe.
   c. **Acc (target) = Ext**: Peter*traf*einen stärkeren Boxer*als*Julian*einen traf. *Peters*Boxer*hatte*unheimlich schnelle*Reflexe.
   d. **Acc (control)**: Peter*traf*einen starken Boxer*und*schickte sogleich ein Video an*Julian,*der*auch*einen traf.*Peters*Boxer*hatte*unheimlich schnelle* Reflexe.
2. a. **Nom (target) = Int**: Mario*besuchte*einen lauteren Sänger*als*Sam*einer ist.*Marios*Sänger*hatte*ein außerordentlich lautes*Organ.
   b. **Nom (control)**: Mario*besuchte*einen lauten Sänger*und*kopierte sofort dessen Album für*Sam,*der*auch*einer ist.*Marios*Sänger*hatte*ein außerordentlich lautes*Organ.
   c. **Acc (target) = Ext**: Mario*besuchte*einen lauteren Sänger*als*Sam*einen besuchte.*Marios*Sänger*hatte*ein außerordentlich lautes*Organ.
   d. **Acc (control)**: Mario*besuchte*einen lauten Sänger*und*kopierte sofort dessen Album für*Sam,*der*auch*einen besuchte.*Marios*Sänger*hatte*ein außerordentlich lautes*Organ.
3. a. **Nom (target) = Int**: Elke*engagierte*einen klügeren Mitarbeiter*als*Dennis

*einer ist.*Elkes*Mitarbeiter*hatte*eine unheimlich schnelle*Auffassungsgabe.

b. **Nom (control)**: Elke*engagierte*einen klugen Mitarbeiter*und*schrieb sofort eine Mail an*Dennis,*der*auch*einer ist.*Elkes*Mitarbeiter*hatte*eine unheimlich schnelle*Auffassungsgabe.

c. **Acc (target) = Ext**: Elke*engagierte*einen klügeren Mitarbeiter*als*Denni s*einen engagierte.*Elkes*Mitarbeiter*hatte*eine unheimlich schnelle *Auffassungsgabe.

d. **Acc (control)**: Elke*engagierte*einen klugen Mitarbeiter*und*schrieb sofort eine Mail an*Dennis,*der*auch*einen engagierte.*Elkes*Mitarbeiter*hatte* eine unheimlich schnelle*Auffassungsgabe.

4. a. **Nom (target) = Int**: Eva*fotografierte*ein schöneres Model*als*Markus*eines ist.*Evas*Model*hatte*ungewöhnlich ausdrucksstarke*Augen.

b. **Nom (control)**: Eva*fotografierte*ein schönes Model*und*schickte gleich eine MMS an*Markus,*der*auch*eines ist.*Evas*Model*hatte*ungewöhnlich ausdrucksstarke*Augen.

c. **Acc (target) = Ext**: Eva*fotografierte*ein schöneres Model*als*Markus*eines fotografierte.*Evas*Model*hatte*ungewöhnlich ausdrucksstarke*Augen.

d. **Acc (control)**: Eva*fotografierte*ein schönes Model*und*schickte gleich eine MMS an*Markus,*der*auch*eines fotografierte.*Evas*Model*hatte* ungewöhnlich ausdrucksstarke*Augen.

5. a. **Nom (target) = Int**: Anne*lobte*einen erfolgreicheren Unternehmer*als*Phil *einer ist.*Annes*Unternehmer*hat*schon sehr viele Geschäfte*abgewickelt.

b. **Nom (control)**: Anne*lobte*einen erfolgreichen Unternehmer*und*sendete sogleich eine Akte an*Phil,*der*auch*einer ist.*Annes*Unternehmer*hat*schon sehr viele Geschäfte*abgewickelt.

c. **Acc (target) = Ext**: Anne*lobte*einen erfolgreicheren Unternehmer*als*Phil *einen lobte.*Annes*Unternehmer*hat*schon sehr viele Geschäfte*abgewickelt.

d. **Acc (control)**: Anne*lobte*einen erfolgreichen Unternehmer*und*sendete sogleich eine Akte an*Phil,*der*auch*einen lobte.*Annes*Unternehmer*hat*schon sehr viele Geschäfte*abgewickelt.

6. a. **Nom (target) = Int**: Kim*förderte*einen besseren Schüler*als*Daniel*einer ist.*Kims*Schüler*arbeitete*im Unterricht*sehr gut mit.

b. **Nom (control)**: Kim*förderte*einen guten Schüler*und*korrigierte dazu eine Arbeit für*Daniel,*der*auch*einer ist.*Kims*Schüler*arbeitete*im Unterricht*sehr gut mit.

c. **Acc (target) = Ext**: Kim*förderte*einen besseren Schüler*als*Daniel*einen förderte.*Kims*Schüler*arbeitete*im Unterricht*sehr gut mit.

d. **Acc (control)**: Kim*förderte*einen guten Schüler*und*korrigierte dazu eine Arbeit für*Daniel,*der*auch*einen förderte.*Kims*Schüler*arbeitete*im Unterricht*sehr gut mit.

7. a. **Nom (target) = Int**: Stefan*überholte*einen schnelleren Läufer*als*Nick* einer ist.*Stefans*Läufer*hatte*eine perfekt trainierte*Muskulatur.

b. **Nom (control)**: Stefan*überholte*einen schnellen Läufer*und*schickte das Siegesfoto an*Nick,*der*auch*einer ist.*Stefans*Läufer*hatte*eine perfekt trainierte*Muskulatur.

c. **Acc (target) = Ext**: Stefan*überholte*einen schnelleren Läufer*als*Nick* einen überholte.*Stefans*Läufer*hatte*eine perfekt trainierte*Muskulatur.

d. **Acc (control)**: Stefan*überholte*einen schnellen Läufer*und*schickte das Siegesfoto an*Nick,*der*auch*einen überholte.*Stefans*Läufer*hatte*eine perfekt trainierte*Muskulatur.

8. a. **Nom (target) = Int**: Tim*umarmte*einen größeren Mann*als*Christoph*einer ist.*Tims*Mann*war*ganze 2m*groß.

b. **Nom (control)**: Tim*umarmte*einen großen Mann*und*schickte dann eine WhatsApp an*Christoph,*der*auch*einer ist.*Tims*Mann*war*ganze 2m*groß.

c. **Acc (target) = Ext**: Tim*umarmte*einen größeren Mann*als*Christoph*einen umarmte.*Tims*Mann*war*ganze 2m*groß.

d. **Acc (control)**: Tim*umarmte*einen großen Mann*und*schickte dann eine WhatsApp an*Christoph,*der*auch*einen umarmte.*Tims*Mann*war*ganze 2m *groß.

9. a. **Nom (target) = Int**: Katja*suchte*einen geschickteren Handwerker*als*Mark *einer ist.*Katjas*Wunsch-Handwerker*sollte*wirklich alles*reparieren können.

b. **Nom (control)**: Katja*suchte*einen geschickten Handwerker*und*stellte viele Fragen an*Mark,*der*auch*einer ist.*Katjas*Wunsch-Handwerker*sollte* wirklich alles*reparieren können.

c. **Acc (target) = Ext**: Katja*suchte*einen geschickteren Handwerker*als*Mark *einen suchte.*Katjas*Wunsch-Handwerker*sollte*wirklich alles*reparieren können.

d. **Acc (control)**: Katja*suchte*einen geschickten Handwerker*und*stellte

viele Fragen an*Mark,*der*auch*einen suchte.*Katjas*Wunsch-Handwerker*sollte wirklich alles*reparieren können.

10. a. **Nom (target) = Int**: Fabian*befragte*einen lustigeren Berater*als*Leon* einer ist.*Fabians*Berater*hatte*einen sehr guten*Sinn für Humor.
    b. **Nom (control)**: Fabian*befragte*einen lustigen Berater*und*erzählte es sogleich*Leon,*der*auch*einer ist.*Fabians*Berater*hatte*einen sehr guten*Sinn für Humor.
    c. **Acc (target) = Ext**: Fabian*befragte*einen lustigeren Berater*als*Leon* einen befragte.*Fabians*Berater*hatte*einen sehr guten*Sinn für Humor.
    d. **Acc (control)**: Fabian*befragte*einen lustigen Berater*und*erzählte es sogleich*Leon,*der*auch*einen befragte.*Fabians*Berater*hatte*einen sehr guten*Sinn für Humor.
11. a. **Nom (target) = Int**: Sam*erwartete*einen fröhlicheren Kollegen*als*Sven*einer ist.*Sams*Kollege*war*ein äußerst angenehmer*Zeitgenosse.
    b. **Nom (control)**: Sam*erwartete*einen fröhlichen Kollegen*und*skypte währenddessen mit*Sven,*der*auch*einer ist.*Sams*Kollege*war*ein äußerst angenehmer* Zeitgenosse.
    c. **Acc (target) = Ext**: Sam*erwartete*einen fröhlicheren Kollegen*als*Sven *einen erwartete.*Sams*Kollege*war*ein äußerst angenehmer*Zeitgenosse.
    d. **Acc (control)**: Sam*erwartete*einen fröhlichen Kollegen*und*skypte währenddessen mit*Sven,*der*auch*einen erwartete.*Sams*Kollege*war*ein äußerst angenehmer*Zeitgenosse.
12. a. **Nom (target) = Int**: Anja*kündigte*einem fleißigeren Mitarbeiter*als*Marcel *einer ist.*Anjas*Mitarbeiter*war*bei seinen Aufgaben*sehr sorgfältig.
    b. **Nom (control)**: Anja*kündigte*einem fleißigen Mitarbeiter*und*informierte sogleich*Marcel,*der*auch*einer ist.*Anjas*Mitarbeiter*war*bei seinen Aufgaben *sehr sorgfältig.
    c. **Acc (target) = Ext**: Anja*kündigte*einem fleißigeren Mitarbeiter*als*Marcel *einem kündigte.*Anjas*Mitarbeiter*war*bei seinen Aufgaben*sehr sorgfältig.
    d. **Acc (control)**: Anja*kündigte*einem fleißigen Mitarbeiter*und*informierte sogleich*Marcel,*der*auch*einem kündigte.*Anjas*Mitarbeiter*war*bei seinen Aufgaben*sehr sorgfältig.
13. a. **Nom (target) = Int**: Maike*bestrafte*einen frecheren Schüler*als*David*einer ist.*Maikes*Schüler*war*äußerst*vorlaut.
    b. **Nom (control)**: Maike*bestrafte*einen frechen Schüler*und*schrieb danach

eine Notiz für*David,*der*auch*einer ist.*Maikes*Schüler*war*äußerst*vorlaut.

c. **Acc (target) = Ext**: Maike*bestrafte*einen frecheren Schüler*als*David*einen bestrafte.*Maikes*Schüler*war*äußerst*vorlaut.

d. **Acc (control)**: Maike*bestrafte*einen frechen Schüler*und*schrieb danach eine Notiz für*David,*der*auch*einen bestrafte.*Maikes*Schüler*war*äußerst* vorlaut.

14. a. **Nom (target) = Int**: Tanja*beriet*einen freundlicheren Klienten*als*Simon *einer ist.*Tanjas*Klient*hatte*sehr höfliche*Umgangsformen.

b. **Nom (control)**: Tanja*beriet*einen freundlichen Klienten*und*schickte danach ein Fax an*Simon,*der*auch*einer ist.*Tanjas*Klient*hatte*sehr höfliche *Umgangsformen.

c. **Acc (target) = Ext**: Tanja*beriet*einen freundlicheren Klienten*als*Simon *einen beriet.*Tanjas*Klient*hatte*sehr höfliche*Umgangsformen.

d. **Acc (control)**: Tanja*beriet*einen freundlichen Klienten*und*schickte danach ein Fax an*Simon,*der*auch*einen beriet.*Tanjas*Klient*hatte*sehr höfliche*Umgangsformen.

15. a. **Nom (target) = Int**: Lisa*meldete*einen aggressiveren Spieler*als*Thorsten *einer ist.*Lisas*Spieler*hatte*ein äußerst hitziges*Temperament.

b. **Nom (control)**: Lisa*meldete*einen aggressiven Spieler*und*sendete sofort eine SMS an*Thorsten,*der*auch*einer ist.*Lisas*Spieler*hatte*ein äußerst hitziges*Temperament.

c. **Acc (target) = Ext**: Lisa*meldete*einen aggressiveren Spieler*als*Thorsten *einen meldete.*Lisas*Spieler*hatte*ein äußerst hitziges*Temperament.

d. **Acc (control)**: Lisa*meldete*einen aggressiven Spieler*und*sendete sofort eine SMS an*Thorsten,*der*auch*einen meldete.*Lisas*Spieler*hatte*ein äußerst hitziges*Temperament.

16. a. **Nom (target) = Int**: Tom*beschenkte*einen anspruchsvolleren Kollegen*als *Kai*einer ist.*Toms*Kollege*war*nur selten*zufrieden.

b. **Nom (control)**: Tom*beschenkte*einen anspruchsvollen Kollegin*und *telefonierte später mit*Kai,*der*auch*einer ist.*Toms*Kollege*war*nur selten* zufrieden.

c. **Acc (target) = Ext**: Tom*beschenkte*einen anspruchsvolleren Kollegen*als *Kai*einen beschenkte.*Toms*Kollege*war*nur selten*zufrieden.

d. **Acc (control)**: Tom*beschenkte*einen anspruchsvollen Kollegen*und *telefonierte später mit*Kai,*der*auch*einen beschenkte.*Toms*Kollege*war*nur

selten*zufrieden.

17. a. **Nom (target) = Int**: Christian*befragte*einen ehrlicheren Passanten*als *Thomas*einer ist.*Christians*Passant*hatte*sehr viele Märchengeschichten* erzählt.
    b. **Nom (control)**: Christian*befragte*einen ehrlichen Passanten*und*sprach dann mit*Thomas,*der*auch*einer ist.*Christians*Passant*hatte*sehr viele Märchengeschichten*erzählt.
    c. **Acc (target) = Ext**: Christian*befragte*einen ehrlicheren Passanten*als *Thomas*einen befragte.*Christians*Passant*hatte*sehr viele Märchengeschichten*erzählt.
    d. **Acc (control)**: Christian*befragte*einen ehrlichen Passanten*und*sprach dann mit*Thomas,*der*auch*einen befragte.*Christians*Passant*hatte*sehr viele Märchengeschichten*erzählt.
18. a. **Nom (target) = Int**: Lisa*bediente*einen arroganteren Geschäftsmann*als *Michael*einer ist.*Lisas*Geschäftsmann*hatte*eine sehr unangenehme*Art.
    b. **Nom (control)**: Lisa*bediente*einen arroganten Geschäftsmann*und*tuschelte dann mit*Michael,*der*auch*einer ist.*Lisas*Geschäftsmann*hatte*eine sehr unangenehme*Art.
    c. **Acc (target) = Ext**: Lisa*bediente*einen arroganteren Geschäftsmann*als *Michael*einen bediente.*Lisas*Geschäftsmann*hatte*eine sehr unangenehme* Art.
    d. **Acc (control)**: Lisa*bediente*einen arroganten Geschäftsmann*und*tuschelte dann mit*Michael,*der*auch*einen bediente.*Lisas*Geschäftsmann*hatte*eine sehr unangenehme*Art.
19. a. **Nom (target) = Int**: Antje*belohnte*einen motivierteren Teilnehmer*als* Karl *einer ist.*Antjes*Teilnehmer*hat*die ganze Gruppe*animiert.
    b. **Nom (control)**: Antje*belohnte*einen motivierten Teilnehmer*und*schickte später Dateien an*Karl,*der*auch*einer ist.*Antjes*Teilnehmer*hat*die ganze Gruppe*animiert.
    c. **Acc (target) = Ext**: Antje*belohnte*einen motivierteren Teilnehmer*als* Karl *einen belohnte.*Antjes*Teilnehmer*hat*die ganze Gruppe*animiert.
    d. **Acc (control)**: Antje*belohnte*einen motivierten Teilnehmer*und*schickte später Dateien an*Karl,*der*auch*einen belohnte.*Antjes*Teilnehmer*hat*die ganze Gruppe*animiert.
20. a. **Nom (target) = Int**: Anne*behandelte*einen empfindlicheren Patien-

ten*als *Manu*einer ist.*Annes*Patient*konnte*gar keine Schmerzen*ertragen.

b. **Nom (control)**: Anne*behandelte*einen empfindlichen Patienten*und*beriet später*Manu,*der*auch*einer ist.*Annes*Patient*konnte*gar keine Schmerzen *ertragen.

c. **Acc (target) = Ext**: Anne*behandelte*einen empfindlicheren Patienten*als *Manu*einen behandelte.*Annes*Patient*konnte*gar keine Schmerzen* ertragen.

d. **Acc (control)**: Anne*behandelte*einen empfindlichen Patienten*und*beriet später*Manu,*der*auch*einen behandelte.*Annes*Patient*konnte*gar keine Schmerzen*ertragen.

21. a. **Nom (target) = Int**: Janine*half*einem kompetenteren Praktikanten*als*Rene *einer ist.*Janines*Praktikant*bearbeitete*die Aufgaben*sehr selbständig.

b. **Nom (control)**: Janine*half*einem kompetenten Praktikanten*und*schickte alsbald eine Mail an*Rene,*der*auch*einer ist.*Janines*Praktikant*bearbeitete*die Aufgaben*sehr selbständig.

c. **Acc (target) = Ext**: Janine*half*einem kompetenteren Praktikanten*als*Rene *einem half.*Janines*Praktikant*bearbeitete*die Aufgaben*sehr selbständig.

d. **Acc (control)**: Janine*half*einem kompetenten Praktikanten*und*schickte alsbald eine Mail an*Rene,*der*auch*einem half.*Janines*Praktikant*bearbeitete *die Aufgaben*sehr selbständig.

22. a. **Nom (target) = Int**: Lea*besiegte*einen angeseheneren Spieler*als*Yannik *einer ist.*Leas*Spieler*hatte*schon sehr viele Medaillen*gewonnen.

b. **Nom (control)**: Lea*besiegte*einen angesehenen Spieler*und*feierte danach mit*Yannik,*der*auch*einer ist.*Leas*Spieler*hatte*schon sehr viele Medaillen*gewonnen.

c. **Acc (target) = Ext**: Lea*besiegte*einen angeseheneren Spieler*als*Yannik *einen besiegte.*Leas*Spieler*hatte*schon sehr viele Medaillen*gewonnen.

d. **Acc (control)**: Lea*besiegte*einen angesehenen Spieler*und*feierte danach mit*Yannik,*der*auch*einen besiegte.*Leas*Spieler*hatte*schon sehr viele Medaillen*gewonnen.

23. a. **Nom (target) = Int**: Jan*rasierte*einen großzügigeren Kunden*als*Felix* einer ist.*Jans*Kunde*hat*sehr viel Trinkgeld*dagelassen.

b. **Nom (control)**: Jan*rasierte*einen großzügigen Kunden*und*schickte danach ein Foto an*Felix,*der*auch*einer ist.*Jans*Kunde*hat*sehr viel Trinkgeld *dagelassen.

c. **Acc (target) = Ext**: Jan*rasierte*einen großzügigeren Kunden*als*Felix* einen rasierte.*Jans*Kunde*hat*sehr viel Trinkgeld*dagelassen.

d. **Acc (control)**: Jan*rasierte*einen großzügigen Kunden*und*schickte danach ein Foto an*Felix,*der*auch*einen rasierte.*Jans*Kunde*hat*sehr viel Trinkgeld *dagelassen.

24. a. **Nom (target) = Int**: Julia*unterrichtete*einen aufmerksameren Schüler*als *Dirk *einer ist.*Julias*Schüler*war*sehr*konzentriert.

b. **Nom (control)**: Julia*unterrichtete*einen aufmerksamen Schüler*und*motivierte außerdem*Dirk,*der*auch*einer ist.*Julias*Schüler*war*sehr*konzentriert.

c. **Acc (target) = Ext**: Julia*unterrichtete*einen aufmerksameren Schüler*als *Dirk *einen unterrichtete.*Julias*Schüler*war*sehr*konzentriert.

d. **Acc (control)**: Julia*unterrichtete*einen aufmerksamen Schüler*und*motivierte außerdem*Dirk,*der*auch*einen unterrichtete.*Julias*Schüler*war*sehr*konzentriert.

C.2 Bar Plots

Here are the bar plots for the eye-tracking experiments for the following measures broken down by the overall measure+the critical individual ROIs (regions of interest). I provide both statistics that came out marginally significant and significant before the Bonferroni correction.

1. first fixation duration
2. second pass time
3. total time
4. first pass regression ratios
5. regression path duration
6. selective regression path
7. rereading duration

1. First Fixation Duration

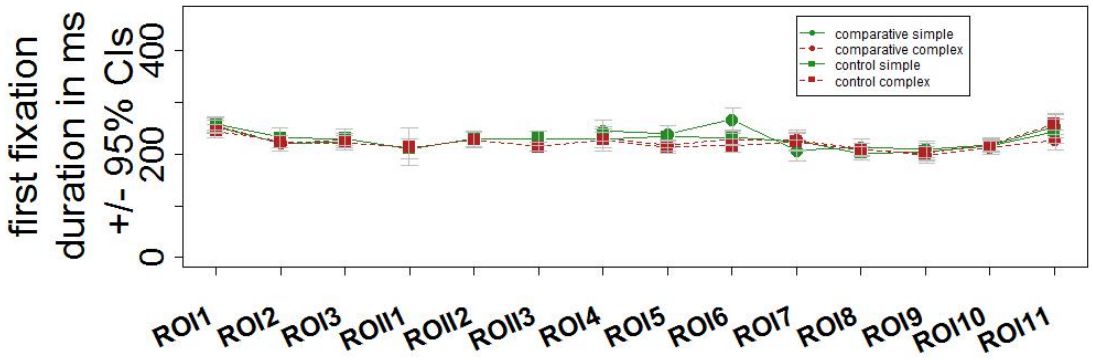


Figure C.1: First Fixation Duration

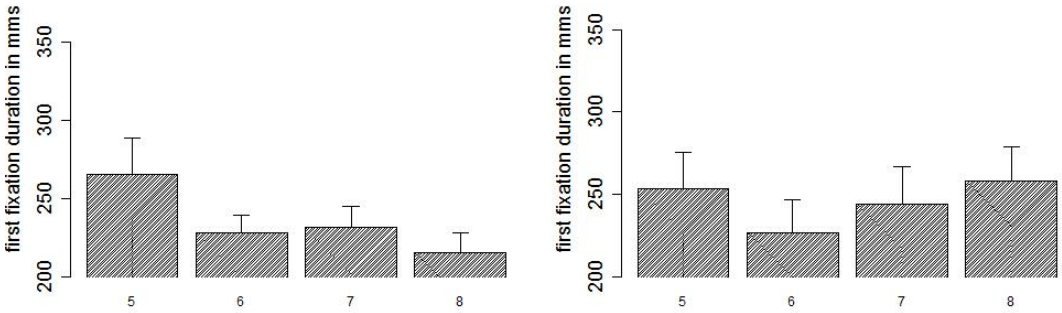


Figure C.2: First Fixation Duration ROIs

2. Second Pass Time

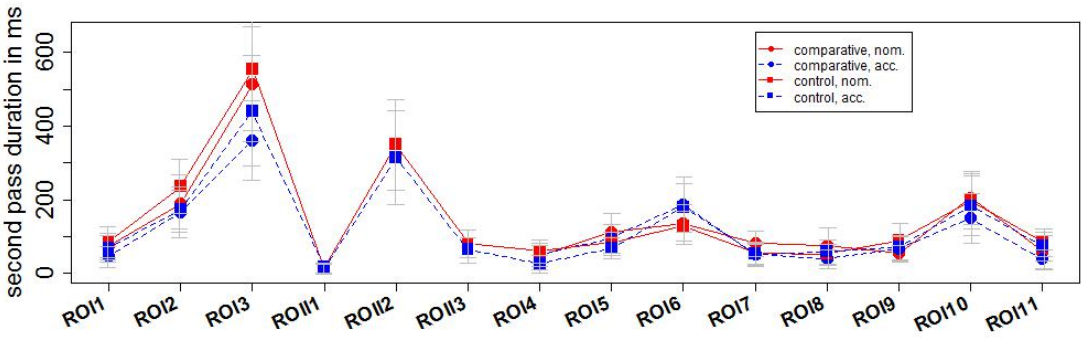


Figure C.3: Second Pass Time

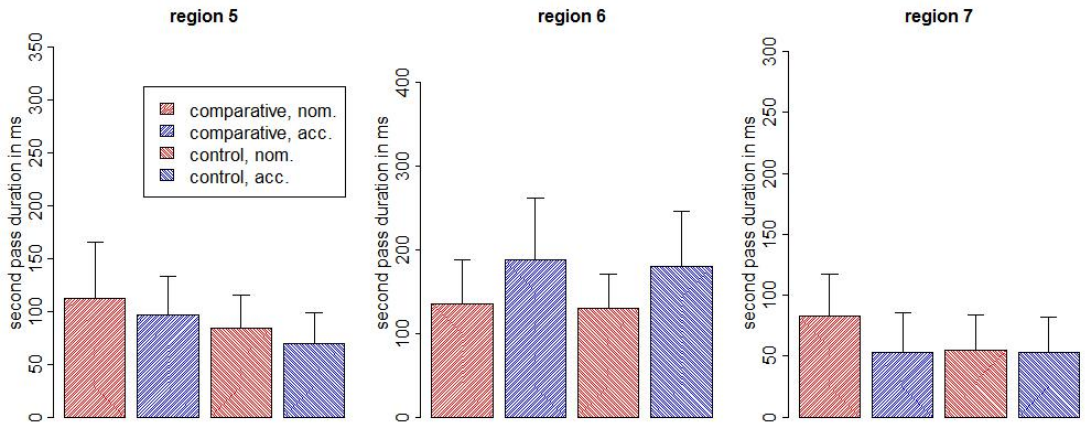


Figure C.4: Second Pass Time Individual ROIs

Region 6: NOM. < ACC. ($p = .036$)

3. Total Time

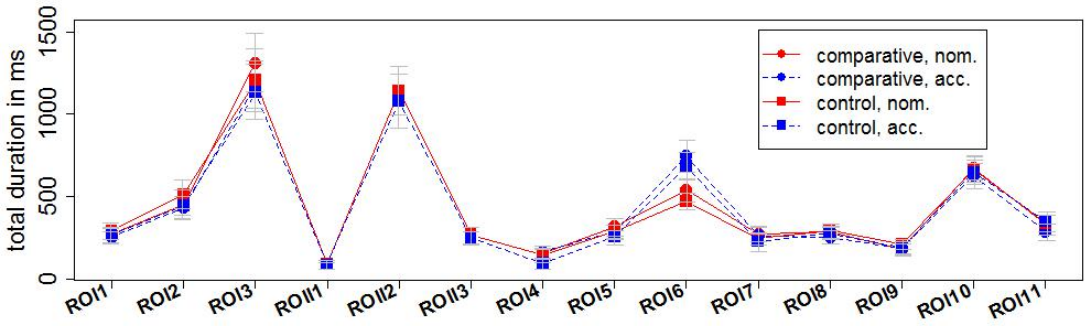


Figure C.5: Total Time

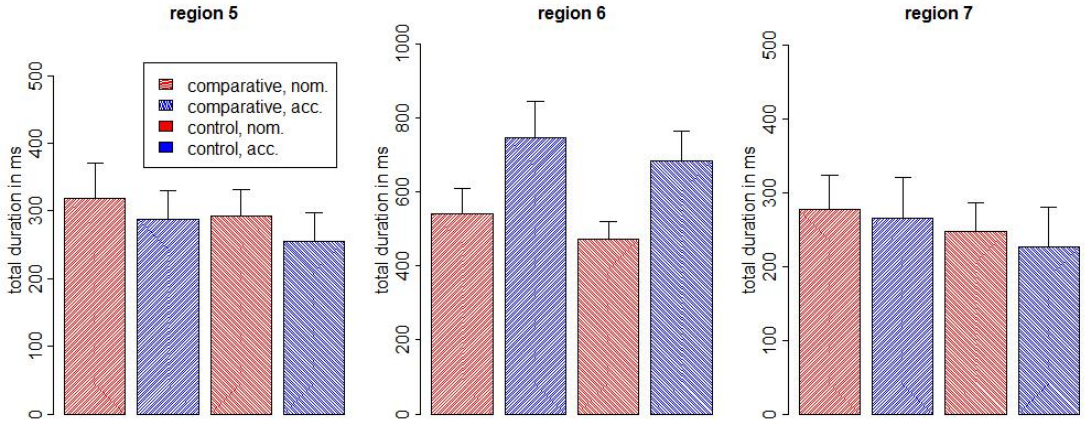


Figure C.6: Total Time Individual ROIs

4. First Pass Regression Ratios

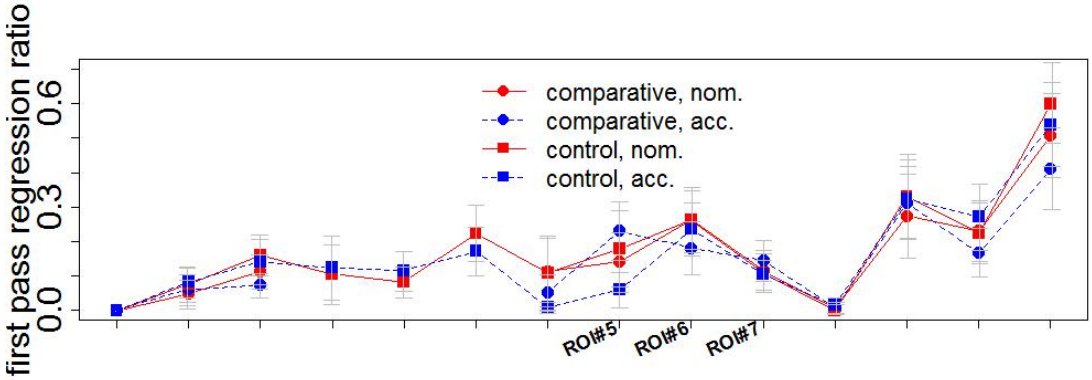


Figure C.7: First Pass Regression Ratios

Region 5: control < comp. ($p = .078$), marginal before Bonferroni correction

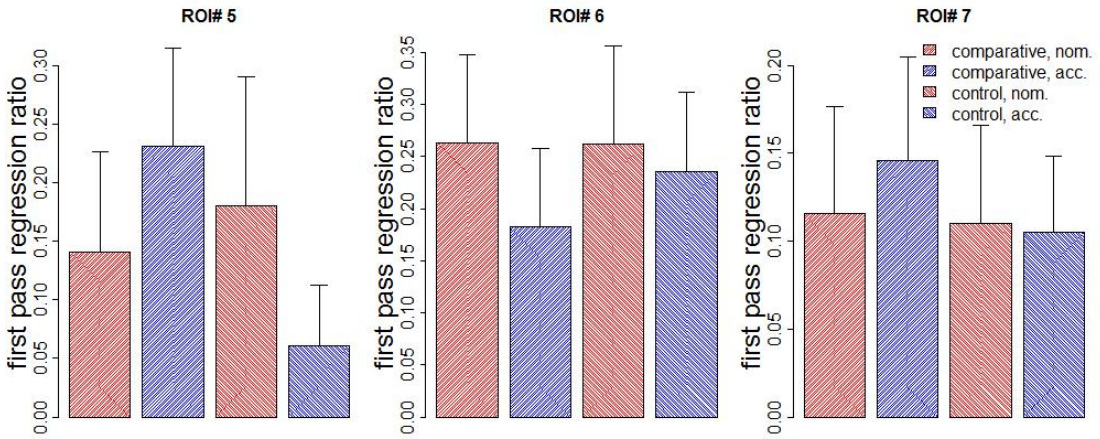


Figure C.8: First Pass Regression Ratios Individual ROIs

Region 6: ACC. $<$ NOM. ($p = .089$), marginal before Bonferroni correction

5. Regression Path Duration

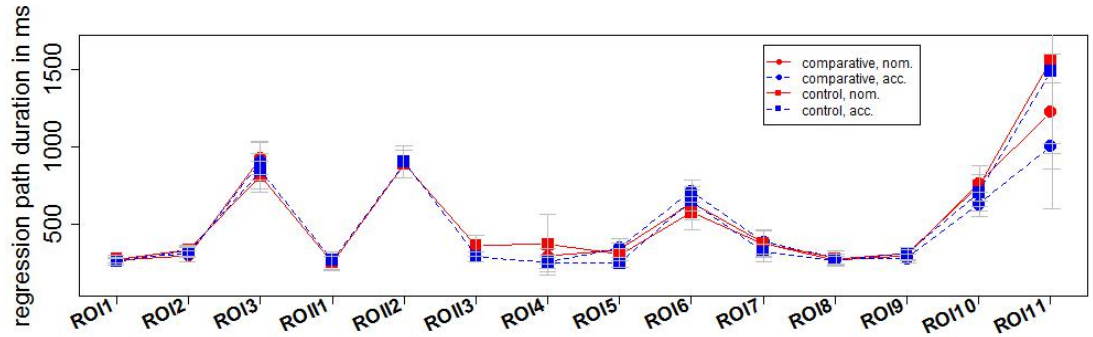


Figure C.9: Regression Path Duration

Region 5:

- control $<$ comp. ($p = .037$)
- Main effect case in comps. ($p = .03$) vs. main effect of case in controls ($p = .218$)

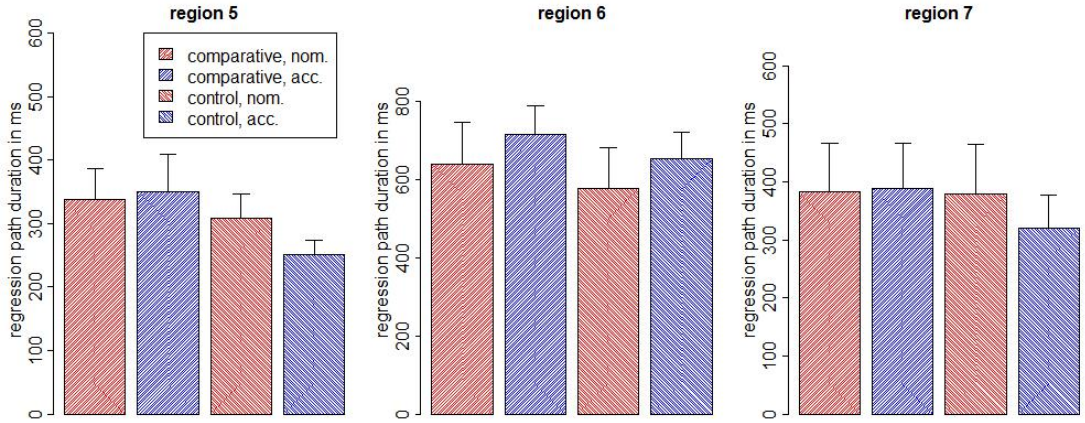


Figure C.10: Regression Path Duration Individual ROIs

- **PREDICTED INTERACTION!** ($p = .003$)

Region 6:

- NOM. < ACC. ($p = .095$), marginal before Bonferroni correction;
- control < comp. ($p = .099$), marginal before Bonferroni correction

6. Selective Regression Path

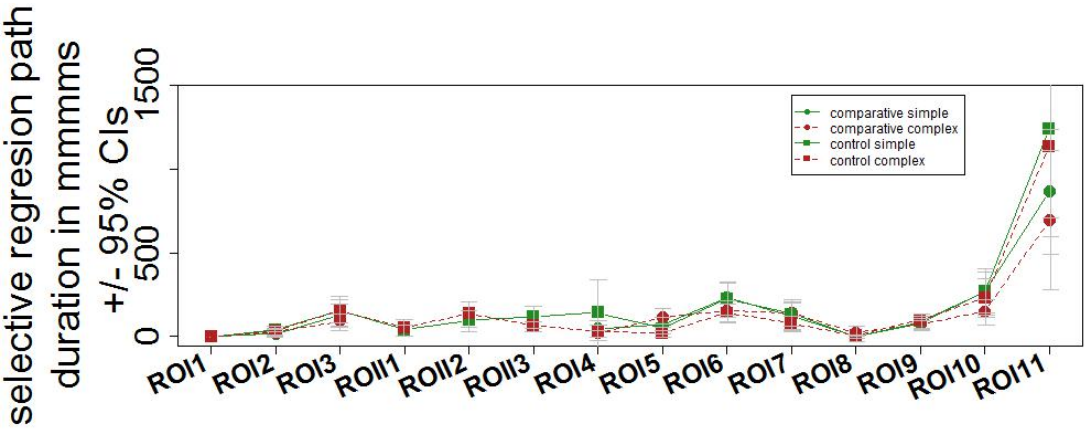


Figure C.11: Selective Regression Path

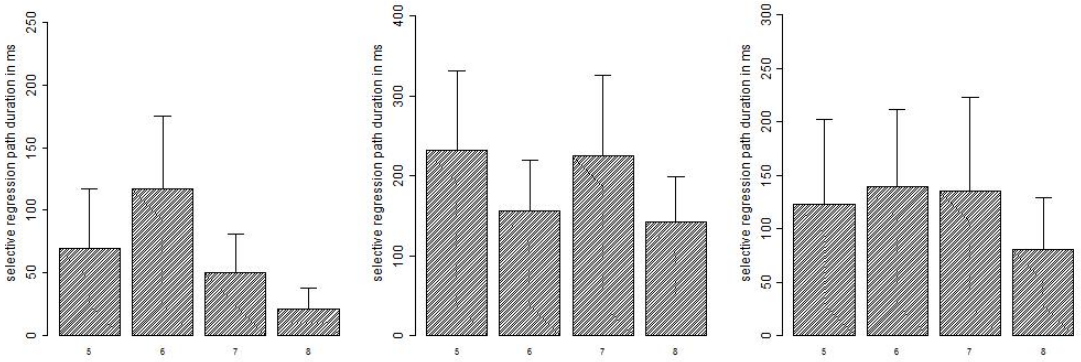


Figure C.12: Regression Path Duration Individual ROIs

7. Rereading Duration

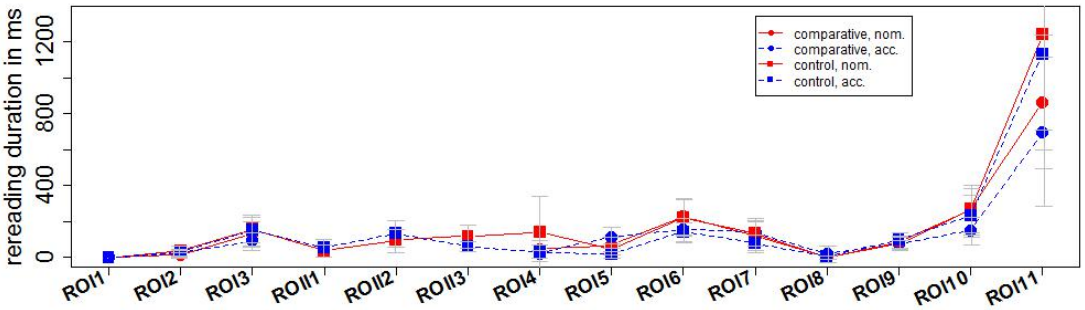


Figure C.13: Rereading Duration

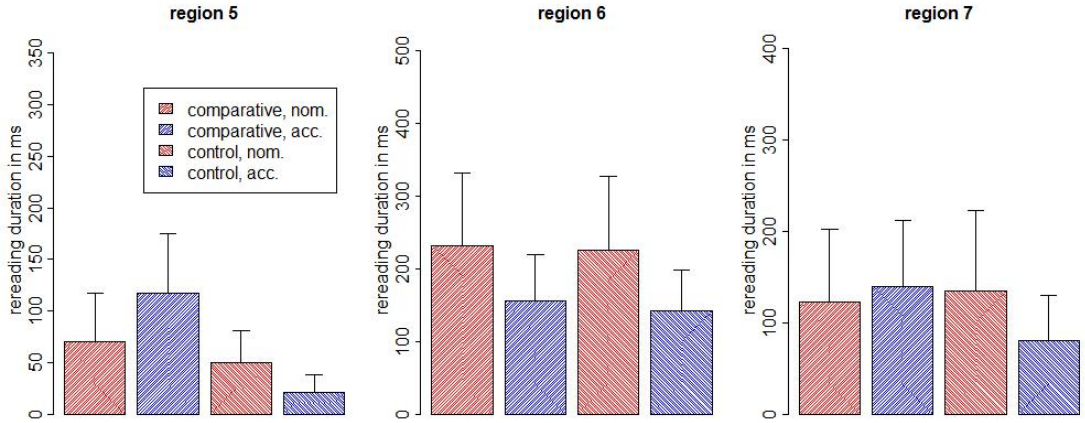


Figure C.14: Rereading Duration

Region 5: control < comp. ($p = .018$)

Region 6: ACC. < NOM. ($p = .093$), marginal before Bonferroni correction

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