Chapter 11

Negation, comparative and alternatives: Experimental evidence from Czech

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The semantic interplay of negation with focus and scalar implicatures influences acceptability judgments. This paper describes two readings of sentences with comparatives and negation, namely the equality reading and the interval reading. The experiment provides evidence that sentences with negated comparatives prefer the equality reading in Czech. I argue that Czech negated comparatives result in the preferential equality reading as do English negated comparatives; but I challenge the claim that Czech negation *ne* 'no' activates focus alternatives, unlike in English negated comparatives with *no* where scalar alternatives cause the equality reading. I argue that focus alternatives and scalar alternatives are the same. Both Czech *ne-* 'not' and English *not* in verbal negation comparatives lead to the preferential equality reading if negation has narrow scope over the maximality operator.

Keywords: constituent negation; verbal negation; scalar implicatures; focus alternatives; comparative; Czech; experimental semantics

1 Introduction

In recent years, the topic of scalar implicatures and numerals has attracted considerable attention, and the research gave rise to several influential theories (Larson 1988; Krifka 1999; Sauerland 2004; Fox & Hackl 2006, among others). This article investigates how negation interacts with comparatives involving numerals. I will focus on the comparison of English data with Czech. Though the semantics of many different types of Slavic numerals have recently been explored with considerable success (e.g. Dočekal 2013; Wągiel 2014; 2015), so far little attention has

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been dedicated to their behavior in the interaction with negation and comparatives (with the notable exceptions of Dočekal 2017 and Dočekal & Wągiel 2018 respectively). In this paper, I intend to shed new light on this topic by means of experimental investigation.

The article investigates how negation interacts with comparatives. We start with Rick Nouwen's observation about English negated comparatives (Nouwen 2008). He distinguishes two sub-types of comparatives, i.e., strict comparatives (*-er*) in (1a) and non-strict comparatives (*no(t) -er*) in (1b).

(1) a. John found more than 20 mushrooms.
b. John found no more than 20 mushrooms.

Strict comparatives express either the relation *less* or *more*. We would expect that the only thing non-strict comparatives do is that they simply reverse the relation. But, according to Nouwen (2008), negation changes the relation from $>$ to $\leq$ and from $<$ to $\geq$. Non-strict comparatives are ambiguous due to their ability to express either *less/more* or *equality*.

Non-strict comparatives can be negated either by constituent negation (CN), as in (2a), or by verbal negation (VN), as in (2b).

(2) a. John found no more than 20 mushrooms.
b. John did not find more than 20 mushrooms.

We focus on whether these two types of negation (VN/CN) influence the ambiguity of non-strict comparatives and whether the composition of the meaning of non-strict comparatives happens in the same way in English and Czech.

1.1 English non-strict comparatives

A sentence with a comparative activates scalar alternatives. Scalar alternatives are present in scalar implications developed by Horn (1989; 1996), they are a subtype of generalized conversational implicature associated with scalar values ordered from the weakest value to the strongest value (Horn 2013). Consider the following sample sentences with their scalar implicature (SI).

(3) Some people left.
SI: ¬ all people left

(4) John has two children.
SI: ¬ John has three children

(5) John bought a book or a pen.
SI: ¬ John bought a book and a pen

The strict comparative (6a) and the non-strict comparative (6b) both lead to scalar implications, but with a different result.

(6) a. John found more than 20 mushrooms.
b. John found no more than 20 mushrooms.

The strict comparative in (6a) means that the minimum number of mushrooms is more than 20. The limit lies in the lower bound, but the upper bound is unbounded, i.e. (20,∞).

(7) John found more than 20 mushrooms.
a. truth conditions:
$\text{MAX}_{\text{D}}\big(\lambda y \exists x[\#x = y \wedge \text{MUSHROOM}(x) \wedge \text{FIND}(\text{JOHN}, x)]\big) > 20$

The negation reverses the relation from > to ≤; therefore the non-strict comparative in (6b) means that the maximum number of mushrooms is 20. The limit lies in the upper bound, whereas the lower bound is not specified, but the natural perception of the world limits the minimal number, i.e., (0,20).

Nouwen (2008) explains the composition of non-strict comparatives. According to him, the non-strict comparative in (6b) has two readings: the interval reading corresponds to the relation *less* – (0,20) and the equality reading corresponds to the *equality* relation – (0,20).

If constituent negation negates a comparative (CN-comparative), as in (8), the equality reading results from the strengthening of the truth condition interpretation via scalar implicature. The sentence has standard truth conditions (8a) and also scalar implicatures (8b), (8c), etc., but scalar implicatures are negated because the proposition stating the number of mushrooms is ≤ 19 is logically stronger than the proposition stating the same number is ≤ 20.[1] The equality reading then arises from the denial of scalar implicatures and strengthening of truth conditions.

(8) John found no more than 20 mushrooms.

[1]Logical strength relates to the entailment. The proposition *John didn't find 19 mushrooms* entails the proposition *John didn't find 20 mushrooms*; therefore the first proposition is stronger than the second proposition.

(i) John didn't find 19 mushrooms → John didn't find 20 mushrooms → …

a. truth conditions: $\text{MAX}_{\text{D}}(\lambda d$. the number of mushrooms was $d \leq 20)$
b. SI: $\neg\text{MAX}_{\text{D}}(\lambda d$. the number of mushrooms was $d \leq 19)$
c. SI: $\neg\text{MAX}_{\text{D}}(\lambda d$. the number of mushrooms was $d \leq 18)$
d. $\text{MAX}_{\text{D}}(\lambda d$. the number of mushrooms was $d = 20)$

Nouwen (2008) claims that the most salient interpretation of English CN-comparatives is the equality reading, but he doesn't exclude the interval reading.[2]

If verbal negation negates a comparative (VN-comparative), as in (9), both readings are also possible but due to different reasons than in CN-comparatives. Nouwen (2008) claims that interval and equality readings arise because verbal negation can take two scopes within the proposition: narrow scope, as in (9a), which corresponds to (8a), and wide scope, as in (9b).

(9) John did not find more than 20 mushrooms.
a. $\text{MAX}_{\text{D}}\big(\lambda y \exists x[\#x = y \wedge \text{MUSHROOM}(x) \wedge \text{FIND}(\text{JOHN}, x)]\big) \leq 20$
b. $\neg\text{MAX}_{\text{D}}\big(\lambda y \exists x[\#x = y \wedge \text{MUSHROOM}(x) \wedge \text{FIND}(\text{JOHN}, x)]\big) > 20$

The narrow scope leads to scalar alternatives. As in the CN-comparatives, the scalar alternatives are negated, and the strengthening of truth conditions causes the equality reading. The wide scope is interpreted as a denial and truth conditions of the proposition are weaker: 'it is not true that John found more than 20 mushrooms'. Strengthening does not occur in the construction because no scalar alternatives are present; therefore only the interval reading is possible. Nouwen argues that sentences with VN-comparatives show a preference for the interval reading.

Table 1 summarizes Nouwen's observations of English negated comparatives.

Table 1: English negated comparatives

CN-comparatives	equality reading	preferred
CN-comparatives	interval reading	non-preferred
VN-comparatives (wide scope)	interval reading	preferred
VN-comparatives (wide scope)	equality reading	non-preferred
VN-comparatives (narrow scope)	equality reading	preferred
VN-comparatives (narrow scope)	interval reading	non-preferred

[2]The interval reading arises because scalar implicatures need not be drawn, and the strengthening of truth conditions doesn't occur.

Table 1 shows a nice pattern of English negated comparatives, i.e., CN-comparatives prefer the equality reading, whereas VN-comparatives prefer the interval reading if verbal negation takes wide scope over the maximality operator. The equality reading is preferred in the case of narrow scope of verbal negation. I now contrast this observation with Czech negated comparatives.

1.2 Czech non-strict comparatives

While English CN *no* and VN *not* differ morphologically, Czech CN and VN share the same morphological form *ne*, but its semantic and syntactic properties vary. The marker of CN is a free morpheme; it stands independently in a sentence, as in (10). The marker of VN is an ordinary prefixal verbal negation; it firmly connects to a lexical verb or an auxiliary, as in (11).

(10) Chci být doktorem, ne učitelem.
want.PRS.1SG be.INF doctor.INS.SG not teacher.INS.SG
'I want to be a doctor, not a teacher.'

(11) Nechci být učitelem.
NEG.want.PRS.1SG be.INF teacher.INS.SG
'I don't want to be a teacher.'

Dočekal (2017) investigates non-strict comparatives in Slavic languages, especially in Czech. Following the previous investigation (Jasinskaja 2016, among others), Dočekal starts with an observation that Slavic focus particles have to c-command their focus marked constituents (12), and they have to be adjacent to the focus marked constituent, unlike English focus particles (13).[3] In this respect, Slavic focus particles resemble German focus particles (see Büring & Hartmann 2001).

(12) a. Tento slovník překládá {pouze / ne} [z
this.NOM.SG dictionary.NOM.SG translate.PRS.1SG only not from
angličtiny]$_{FOC}$ do svahilštiny.
English.GEN.SG to Swahili.GEN.SG
'This dictionary translates only/not from English to Swahili.'

[3] Dočekal (2017) gives examples with the Czech prototypical focus particle *pouze* 'only' and he claims that Czech CN behaves the same way.

b. Tento slovník překládá z angličtiny
this.NOM.SG dictionary.NOM.SG translate.PRS.1SG from English.GEN.SG
pouze [do svahilštiny]$_{FOC}$.
only to Swahili.GEN.SG
'This dictionary translates from English to Swahili only.'

c. Tento slovník překládá z angličtiny
this.NOM.SG dictionary.NOM.SG translate.PRS.1SG from English.GEN.SG
ne [do svahilštiny]$_{FOC}$.
not to Swahili.GEN.SG
'This dictionary translates from English not to Swahili.'

(13) a. I behave only [seriously]$_{FOC}$.
b. I only behave [seriously]$_{FOC}$. (Dočekal 2017)

Based on the pattern demonstrated above, Dočekal (2017) concludes that Czech CN is a focus particle, unlike English CN. Negated comparatives activate alternatives in both languages, but the type of alternatives differs: scalar alternatives in English (Nouwen 2008) and focus alternatives in Czech (Dočekal 2017).

We interpret the semantics of focus by the proposal of Rooth (1985; 1992): each sentence with focus has two semantic values: ordinary value $[\![\alpha]\!]^o$ and focus value $[\![\alpha]\!]^f$. Ordinary value is the truth-conditional value of α; focus value is the set of alternatives of α, as in (14b). Focus sensitive operators bear existential presuppositions of focus alternatives. The existential presupposition means that at least one alternative from the set of alternatives is true (see Rooth 1985; 1992).

(14) a. Charles gave a rose to [Mary]$_{FOC}$.
b. {Charles gave a rose to x | x is a person}

CN adds the ¬ operator to a sentence; it negates the assertion and presupposes that at least one alternative is true, as in (15). The assertion is negated (15a), but the constituent negation – being a focus particle – introduces the presupposition in (15b) (which is satisfied by *a hoe*).

(15) Maxwell killed the judge not with [a hammer]$_{FOC}$, but with [a hoe]$_{FOC}$.
a. ¬ Maxwell killed the judge with a hammer
b. Presupposition: $\exists x$[Maxwell killed the judge with x]

Dočekal (2017) selected and classified sentences with CN from the largest corpus of contemporary Czech, SYN2010. He formalizes the negated focus marked

constituent cross-categorically because Czech CN may modify various types of constituents, e.g., PP, AP, NumP, AdvP.[4]

The standard consideration about focus is that both the ordinary value and the focus value have to be of the same semantic type. We illustrate this in example (16): both constituents *a doctor* and *a teacher* are of type $\langle e, t \rangle$ and in this case are predicates. They have to share the same property because they belong to the set of alternatives (in this case professions). The ordinary value *a teacher* is negated by CN, and the focus value *a doctor* satisfies the need for at least one alternative to be true.

(16) Chci být doktorem, ne učitelem.
want.PRS.1SG be.INF doctor.INS.SG not teacher.INS.SG
'I want to be a doctor, not a teacher.'
   a. ordinary value: a teacher
   b. focus value: a doctor

Dočekal proposes that the Czech focus operator CN targets the comparative morpheme *více než* 'no more' that has the following possible alternatives: $\leq, =, >$. At least one alternative must be valid. The alternative $>$ is negated; therefore two alternatives remain: the alternative $=$ leads to the equality reading, as in (17a), the alternative $\leq$ leads to the interval reading, as in (17b).

(17) Peter drank no [more than] 5_{FOC} beers yesterday.
   a. the equality reading: Peter drank no more, but exactly 5 beers.
   b. the interval reading: Peter drank not more, but less than 5 beers or equal.

Both Czech CN- and VN-comparatives are ambiguous between interval and equality reading, but Dočekal (2017) expresses the intuition that Czech CN-comparatives prefer the interval reading, whereas VN-comparatives prefer the equality reading.[5] Table 2 summarizes Dočekal's observations of Czech CN- comparatives.

[4] According to Dočekal (2017), Nouwen's explanation via negated scalar implicatures would not work for Czech because Czech CN modifies various types of constituents, not only numerical phrases. A compromise would be to say that in Czech CN-comparatives activate both scalar alternatives and focus alternatives.

[5] Dočekal (2017) has verified his intuition with a small corpus study; he has checked whether a context of the sentences approves the interval reading or the equality reading. Also, he has consulted the translation of a sample sentence with native speakers of Polish, Bulgarian and Russian. Based on the corpus study and the consultations with several native speakers of Slavic languages, Dočekal argues that CN-comparatives prefer the interval reading in Czech. He describes VN-comparatives only minimally, he mainly investigates CN-comparatives.

Table 2: Czech negated comparatives

CN-comparatives	interval reading	preferred
CN-comparatives	equality reading	non-preferred
VN-comparatives	equality reading	preferred
VN-comparatives	interval reading	non-preferred

Following Dočekal, I hypothesize that Czech CN-comparatives show a preference for the interval reading and VN-comparatives show a preference for the equality reading, although Czech VN-comparatives have been less explored concerning ambiguity than CN-comparatives.

A comparison of Table 1 and Table 2 shows that English CN-comparatives prefer the equality reading, whereas Czech CN-comparatives prefer the interval reading. The verbal negation can take two possible scopes. When English verbal negation is construed with wide scope, there is a preference for the interval reading, but the equality reading is preferred when verbal negation takes narrow scope. An observation of Czech verbal negation is not divided into two possible scopes, the summary is only such that Czech VN-comparatives prefer the equality reading.

The preference for the interval reading or the equality reading of Czech negated comparatives is just Dočekal's hypothesis; therefore it would be appropriate to verify it experimentally. Before introducing an experiment, we will use the remainder of this section to present another approach to alternatives.[6]

We argue so far that the difference between English negated comparatives and Czech negated comparatives comes from different alternatives. According to Nouwen (2008), English constituent negation involves scalar alternatives, but for Dočekal (2017), Czech constituent negation *ne* is a focus particle; therefore Czech constituent negation works with focus alternatives. Focus alternatives differ from scalar alternatives in the fact that scalar alternatives are ordered on a scale from the weakest alternative to the strongest one, whereas focus alternatives are not hierarchically ranked because they are on the same level.

In recent years, the distinction between scalar alternatives and focus alternatives faces doubts (see Katzir 2007; Fox & Katzir 2011; Fox & Spector 2018). Both scalar alternatives and focus alternatives are considered to be determined in the same way, namely as a contextual restriction of the focus value of the sentence. Based on that, alternatives are in a particular logical relationship with the as-

[6]Thanks to an anonymous reviewer for raising this point.

sertion or the prejacent. A unified nature of scalar and focus alternatives goes against standard type-theoretic definitions of focus values (Fox & Katzir 2011). For Krifka (1995), scalar items are inherently focused and their alternatives are scales. The revised theory of scalar and focus alternatives challenges Dočekal's assertion that Nouwen's explanation for English CN-comparatives cannot work for Czech CN-comparatives because, according to Dočekal (2017), negated comparatives in Czech activate a different type of alternatives, unlike in English.

As I indicated before (see footnote 4), if we keep the distinction between scalar and focus alternatives, we have to say that Czech CN-comparatives activate both types of alternatives. An approach unifying these two types of alternatives into one group provides a more comprehensive view of the topic of alternatives.

2 Experiment

I experimentally tested the availability of two readings of negated comparatives in Czech. I focus on (i) whether both CN- and VN-comparatives are ambiguous between the equality and interval readings, and (ii) whether as predicted by the initial hypothesis CN-comparatives show a preference for the interval reading, whereas VN-comparatives show a preference for the equality reading.

2.1 Method

2.1.1 Materials

The experiment consisted of a truth value judgment task that tested to what extent Czech native speakers accept sentences with CN-comparatives *ne víc* 'no more' and VN-comparatives *ne* + *VERB víc* 'not VERB more' with respect to two possible interpretations: the equality reading and the interval reading.[7]

The experiment tested whether a sentence fits a given context. The context preceded the target sentence. Participants were instructed to answer either "yes" (*věta je v daném kontextu pravdivá a vhodná* 'the sentence is true and appropriate in the given context') or "no" (*věta není v daném kontextu pravdivá a vhodná* 'the sentence is not true and appropriate in the given context').[8]

[7]The constituent negation *ne* 'no' stands alone in a sentence, whereas the pre-verbal negation *ne-* 'not' must be connected to a verb.

[8]I agree with an anonymous reviewer that a weaker (interval) reading is true in the equality context, but presumably less natural (acceptable). If a participant prioritizes the truth over naturalness, CN-comparatives, which would be judged unnatural in the equality context according to the initial hypothesis, receive an answer "yes" in the equality condition because

The experiment focused on these main issues:

- the interaction between a comparative and the constituent negation: *ne* + more 'no' (CN)
- the interaction between a comparative and the verbal negation: *ne-* + a verb 'not' (VN)

I investigated whether the syntactic position of comparatives could influence the acceptability of sentences; therefore comparative constructions in tested sentences appeared in two types of syntactic environment: (A) in a predicate position and (B) in an object position. Sentences in the experiment did not include comparatives in a subject position. The support for choosing the two positions (predicate and object) follows from Nirit Kadmon's theory (Kadmon 2001) that claims that the readings can differ in these two positions. I omitted the interaction between topic and CN-/VN-comparatives.

I tested the acceptability of each sentence in two contextual environments: equality (E) and interval (N).

Consequently, I tested the acceptability of negated comparatives in eight conditions:

1. OCNE – CN-comparative in an object position against the equality context
2. OCNN – CN-comparative in an object position against the interval context
3. OVNE – VN-comparative in an object position against the equality context
4. OVNN – VN-comparative in an object position against the interval context
5. PCNE – CN-comparative in a predicate position against the equality context
6. PCNN – CN-comparative in a predicate position against the interval context
7. PVNE – VN-comparative in a predicate position against the equality context
8. PVNN – VN-comparative in a predicate position against the interval context

CN-comparatives are true in the equality context. The weaker reading is also true in the interval context, but more natural. Even if a participant prioritizes the truth or naturalness, the answer should be "yes." But Figure 1 shows that participants answered "no" more often: the interval reading is less acceptable in the interval context than in the equality context.

There were 16 items – each item had 8 conditions (i.e., 128 sentences) – and there were 16 fillers. Each participant judged 16 items and 16 fillers and the order of stimuli was randomized.[9] The experiment was compiled from items and conditions in such a way that each item appeared only once in the experiment, whereas individual conditions cycled (repeated Latin-square design). All items were tested in all eight conditions 1–8 presented above.

Below, two sample items are shown: an item with CN-comparative in a predicate position in (20) and an item with VN-comparative in a predicate position in (21). Items were tested against two contexts: either against the equality context in (18) or against the interval context (19) (not against both contexts simultaneously).

(18) Petr nalil víno do všech 6 sklenic. [E]
Petr.NOM pour.PST.1SG wine.ACC.SG into all.GEN.PL 6 glass.GEN.PL
'Petr poured wine into all 6 glasses.'

(19) Petr nalil víno do všech 5 sklenic. [N]
Petr.NOM pour.PST.1SG wine.ACC.SG into all.GEN.PL 5 glass.GEN.PL
'Petr poured wine into all 5 glasses.'

(20) Na stole je ne víc než 6 sklenic. [PCN]
on table.LOC.SG be.PRS.1SG no more than 6 glass.GEN.PL
'There are no more than 6 glasses on the table.'

(21) Na stole není víc než 6 sklenic. [PVN]
on table.LOC.SG NEG.be.PRS.1SG more than 6 glass.GEN.PL
'There are not more than 6 glasses on the table.'

The other two sample items are following: an item with CN-comparative in an object position in (24) and an item with VN-comparative in an object position in (25). Again, items were tested against two contexts: either against the equality context in (22) or the interval context (23).

(22) Všech 6 růží bylo červených. [E]
all.GEN.PL 6 rose.GEN.PL be.PST.1SG red.GEN.PL
'All 6 roses were red.'

(23) Všech 5 růží bylo červených. [N]
all.GEN.PL 5 rose.GEN.PL be.PST.1SG red.GEN.PL
'All 5 roses were red.'

[9] I used functions *shuffle sequence* and *rshuffle* in a statistical analysis. The functions are defined as randomizing and sequencing operations over an array of items in the Ibex manual.

(24) Jan dal Marii k narozeninám ne víc než 6
John.NOM give.PST.1SG Mary.DAT to birthday.DAT.PL no more than 6
růží. OCN
rose.GEN.PL
'John gave Mary no more than 6 roses for her birthday.'

(25) Jan nedal Marii k narozeninám víc než 6
John.NOM NEG.give.PST.1SG Mary.DAT to birthday.DAT.PL more than 6
růží. OVN
rose.GEN.PL
'John didn't give Mary more than 6 roses for her birthday.'

Each sentence is potentially ambiguous between the interval reading and the equality reading, but I assumed a preference for a particular reading. As predicted by the initial hypothesis, I expected that sentences with CN-comparatives like (20) and (24) will be more acceptable in the interval scenario, as in (19) and (23), whereas sentences with VN-comparatives like (21) and (25) will be more acceptable in the equality scenario, as in (18) and (22).

2.1.2 Procedure and participants

The experiment was run on Ibex and participants completed the experiment online. The experiment began with instructions and following that, the practice items and the truth value judgment and appropriateness task were presented.[10],[11] Participants were asked for the acceptability of a sentence against a context. 52 native speakers of Czech participated in the experiment, mainly students from Masaryk University.

2.2 Results

The fillers in the acceptability task were either uncontroversially grammatical or ungrammatical, and I checked whether the average of each participant's responses to ungrammatical fillers was lower than the average of his or her responses to grammatical fillers. Eight participants had to be excluded due to their unsuccessful scores in fillers; therefore I kept 44 subjects for subsequent analysis.

[10] The terms *true* and *false* are technical terms of logic and linguistics but the experiment targeted native speakers of Czech irrespective of their academic background; therefore I used *adequate* in the introduction.

[11] Follow the link below for the instructions and practice items, items and fillers used in the experiment: GitHub

I designed the truth value judgment task using a mixed-effects linear model. To model the data I constructed 4 linear models (the standard lm command of R) of the acceptability of the 4 conditions as depending on their E/N sub-conditions. The equality condition was taken as the reference level for each condition (PCN, PVN, OCN, OVN).

For all four conditions the linear model summary resulted in a statistically significant difference between E and N sub-conditions: the mean acceptability was a response vector depending on the E/N as a predictor. The statistical outcome was the following:[12]

1. CN-comparative in a predicate position (condition PCN):
   $t = -3.468, p = 0.000662$
2. VN-comparative in a predicate position (condition PVN):
   $t = -3.149, p = 0.00193$
3. CN-comparative in an object position (condition OCN):
   $t = -4.125, p = 5.73e - 05$
4. VN-comparative in an object position (condition OVN):
   $t = -3.207, p = 0.0016$

Figure 1 charts the boxplots of the acceptability ratings depending on the eight conditions and graphically displays the results using inferential statistics (the dot represents the mean).

Figure 1 shows that I did not find the expected interaction between VN and CN. The reference level for the E sub-condition is PCNE condition and the following statistical output shows that all conditions PCNE, PVNE, OCNE, OVNE are statistically not distinguishable from each other: PVNE: $t = 0, p = 1$; OCNE: $t = -1.226, p = 0.222$; OVNE: $t = -0.509, p = 0.612$. The reference level for the N sub-condition is PCNN condition and all conditions PCNN, PVNN, OCNN, OVNN are statistically not distinguishable from each other again. The statistical output is the following: PVNN: $t = 0.300, p = 0.764$; OCNN: $t = -0.600, p = 0.549$; OVNN: $t = -0.751, p = 0.454$. The formal statistical results report no expected interaction between CN and VN conditions.

The experiment provides the following evidence on the discussed interaction in Czech:

[12] The value t states how big a difference there is between the equality reading and the interval reading, the value p expresses how likely it is that the difference between the equality reading and the interval reading is random.

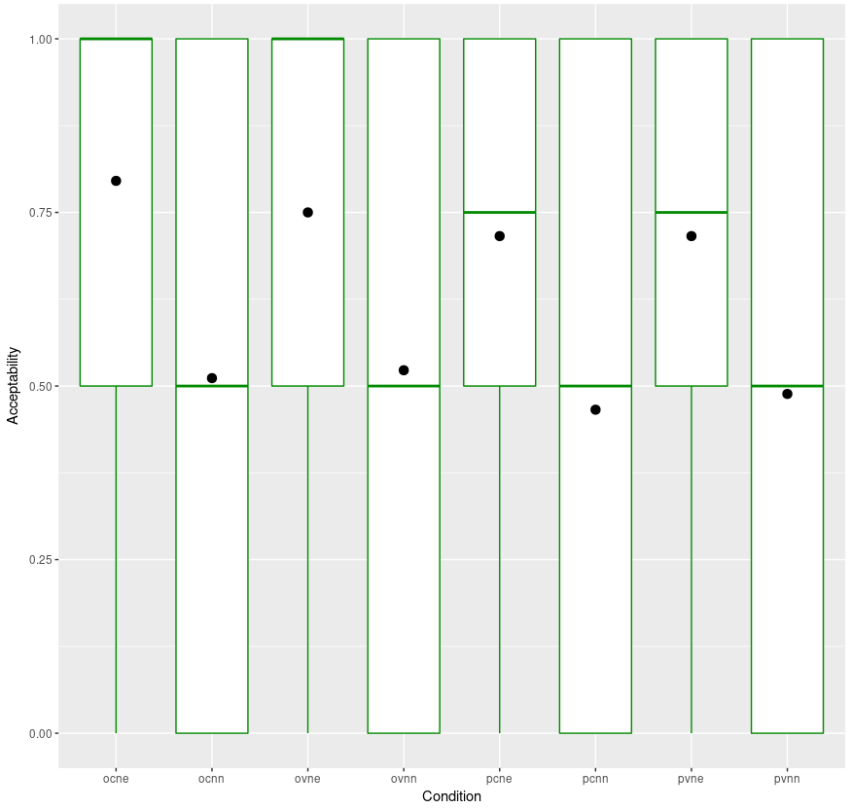

Figure 1: Means of responses average per subject and conditions (20)–(21), (24)–(25) depending on their sub-conditions (18)–(19), (22)–(23) (on the scale 0: inappropriate, 1: appropriate)

(A) Figure 1 shows that the acceptability rates of sentences with a comparative in a predicate position and the acceptability rates of sentences with a comparative in an object position are comparable. It does not support the assumption that the syntactic position of a comparative affects the acceptability of negated comparatives under a particular reading (but see Kadmon 2001).

(B) CN-comparatives and VN-comparatives are comparable.

(C) The acceptability of all four conditions was higher in the equality sub-condition (E) than in the interval sub-condition (N).

The experimental results show that both Czech CN- and VN-comparatives prefer

the equality reading; therefore they do not confirm the initial hypothesis that Czech CN-comparatives lead to the preferential interval reading. Now I turn to the questions: (i) the correlation between focus and two interpretations in Czech, and (ii) reasons leading to two readings of Czech VN-comparatives.

3 Analysis and discussion

3.1 Czech CN-comparatives

The statistical outputs show that sentences with CN-comparatives and VN-comparatives are ambiguous between the equality reading and the interval reading, but both comparative constructions prefer the equality reading. The crucial point is that the results from the experiment go against Dočekal's claim that CN-comparatives show a preference for the interval reading, but I agree with him that Czech CN is a focus operator that has to c-command its focus marked constituent and has to be adjacent to the focus marked constituent.

Previously, Cohen & Krifka (2014) and Geurts & Nouwen (2007) observed that comparatives associate with focus, which can lead to different truth-conditions depending on the focused element. Comparative modifiers like *more than* may focus varying portions of a sentence, as in (26).

(26) a. Ann ate more than $[\text{two}]_{\text{FOC}}$ apples.
b. Ann ate more than $[\text{two apples}]_{\text{FOC}}$.

The sentence with comparative modifiers may have two readings depending on the part of the sentence which is focused. Geurts & Nouwen (2007) observed that (26a) implies that the number of apples that Ann ate exceeds two: 'Ann ate more than two apples, actually she ate four.' (26b) implies that the number of apples that Ann ate was exactly two: 'Ann ate more than two apples, she ate two apples, one pear, and two strawberries.' In the first case, we count how many apples Ann ate, but in the second case, we count how much of everything she ate.

I contend that what we observe in Czech is the same phenomenon as already observed by Dočekal (2017), namely that the comparative marker *než* 'than' can have the equality or interval reading. I add to this an observation that focusing of the numeral would lead to the interval reading only (the presupposed alternatives then are a set of integers $\{0, 1\}$). However, because in Slavic languages the focus operator mainly appears adjacent to the focused element, the focus on the comparative marker *než* signaling the equality reading (and marginally interval

reading) is more salient, which can explain the preference observed in the experiment. Unfortunately, the experiment was a reading task; it did not control for the use of intonation.

3.2 Czech VN-comparatives

The experimental results support Dočekal's assertion that sentences with VN-comparatives indeed lead primarily to the equality reading, but the interval reading is also possible.

At this point, I agree with Nouwen's line of argumentation that a narrow scope of VN (27a) denies a constituent, and a sentence can have the equality reading because: (i) the number is bounded, and (ii) scalar implicatures are present; therefore they can be negated, and the truth condition is strengthened.

(27) John did not find more than 20 mushrooms.

a. $\text{MAX}_{\text{D}}\big(\lambda y \exists x[\#x = y \wedge \text{MUSHROOM}(x) \wedge \text{FIND}(\text{JOHN}, x)]\big) \leq 20$

b. truth conditions: $\text{MAX}_{\text{D}}(\lambda d\,.$ the number of mushrooms was $d) \leq 20$

c. SI: $\neg\text{MAX}_{\text{D}}(\lambda d\,.$ the number of mushrooms was $d) \leq 19$

d. $\text{MAX}_{\text{D}}(\lambda d\,.$ the number of mushrooms was $d) = 20$

The wide scope of VN (28a) denies the whole proposition and the equality interpretation cannot occur because (i) the number is unbounded, and (ii) truth conditions cannot be strengthened because no scalar implicatures arise. The wide scope of VN leads to the interval interpretation (20,∞).

(28) John did not find more than 20 mushrooms.

a. $\neg\text{MAX}_{\text{D}}\big(\lambda y \exists x[\#x = y \wedge \text{MUSHROOM}(x) \wedge \text{FIND}(\text{JOHN}, x)]\big) > 20$

3.3 Discussion

The most salient reading, which Czech speakers associate with both CN- and VN-comparatives, is equality. I analyze it in §3.1 as a result of a particular focus strategy. But I did not control for the focus strategies in the experimental design. This is naturally what I will try to address in the next experiment.

The experiment design would be similar to the experiment presented in this article. Participants would judge whether sentences fit a context. The experiment would test only Czech CN-comparatives because VN-comparatives did not involve focus alternatives. In order to investigate whether focused comparatives indeed

influence the preferred reading, participants would read aloud the tested sentences. The utterances would be recorded and digitized. The appropriate comparison of focused CN-comparatives and unfocused CN-comparatives could clarify the issue of focus and the two possible interpretations of Czech CN-comparatives.[13]

4 Conclusion

I investigated Czech negated comparatives compared with English negated comparatives. I started with the observation that English negated comparatives lead to two interpretations with respect to the type of negation, i.e., the preferred interval reading in the case of VN and the equality reading in the case of CN (Nouwen 2008).

I experimentally tested Czech negated comparatives. Although the experiment to some extent supports Dočekal's observation (Dočekal 2017), it also adds some interesting twists. The experimental results show that both Czech CN-/VN-comparatives are ambiguous between an equality reading and an interval reading, although they strongly prefer the equality interpretation.

Following an approach that unifies scalar alternatives and focus alternatives into one group and claims that both types of alternatives are the same (Katzir 2007; Fox & Katzir 2011; Fox & Spector 2018), I argue that both Czech CN-comparatives and English CN-comparatives result in the preference for equality reading because they activate alternatives.

Czech VN-comparatives behave in the same way as English VN-comparatives: a particular reading depends on whether negation takes wide scope or a narrow scope with respect to a proposition. The narrow scope of VN results in a preference for the equality reading in Czech, whereas the wide scope of VN leads to the interval reading.

[13] Thanks to an anonymous reviewer for raising this point.

Abbreviations

1	first person
ACC	accusative
CN	constituent negation
DAT	dative
E	equality reading
FOC	focus
GEN	genitive
INF	infinitive
INS	instrumental
LOC	locative
N	interval reading
NEG	negation, negative
NOM	nominative
PL	plural
PRS	present
PST	past
SG	singular
SI	scalar implicature
VN	verbal negation

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