

# Extreme Modality

Paul Portner                      Aynat Rubinstein  
Georgetown University    The Hebrew University of Jerusalem

**Introduction.** In the current literature, there is ongoing debate on how modal semantics and scale-based semantics combine in the interpretation of *more likely than*, *completely certain* and other gradable modal expressions. Importing the basic tools of scalar semantics into the modal domain has led Lassiter [2011], Klecha [to appear] and others to conflicting conclusions about the scales underlying the meaning of pairs like *likely/certain*. In this paper, we advocate a new perspective on the debate based on the observation that such pairs exhibit properties of NON-EXTREME/EXTREME adjectives [Paradis, 2001, Rett, 2008, Morzycki, 2012]. Focusing specifically on modal necessity operators, we address both the **compositional modeling** of modal gradability in a Kratzer-style quantificational framework, and the significance of the lexical distinction between **two strength levels** of necessity.

**The modals.** (1) exemplifies the gradability of *should*, *important*, and *likely*, on a par with a concrete gradable adjective such as *big*.

- (1) (a) You should call Barbara more than you should call Alice. (cf. *bigger*)
- (b) It is very important to talk to Barbara. (cf. *very big*)
- (c) It is just as likely that Barbara will win as it is that Alice will. (cf. *as big*)

(2) shows that each of the modals in (1), which we call weak necessity modals, has a strong counterpart which entails it.

- (2) (a) You must call Barbara. (entails *you should*)
- (b) It is crucial to talk to Barbara. (entails *it is important*)
- (c) It is certain that Barbara will win. (entails *it is likely*)

Our key observation is that strong necessity modals (*must*, *crucial*, *certain*) have the properties of extreme adjectives such as *huge*, *excellent* and *gorgeous*.

**Extreme and non-extreme modals.** Strong necessity modals, but not weak ones, have a host of properties associated with extreme adjectives. For example, (3)-(4) (we present additional tests from Morzycki 2012 in the paper):

- Extreme expressions readily take extreme modifiers (*downright huge* vs. *\*downright big*):
- (3) (a) Susan positively/downright must/\*should call her mother.
  - (b) It is positively/downright crucial/\*important for Mary to call her mother.
  - (c) It is positively/flat-out/downright certain/\*likely that Mary will call her mother.
- Extreme expressions are less natural with *very* (*\*very excellent* vs. *very good*):
- (4) (a) Susan very much \*must/should call her mother.
  - (b) It is very \*crucial/important for Mary to call her mother.
  - (c) It is very \*certain/likely that Mary will call her mother.

Lassiter [2011] points out the similarity between certain strong necessity modals (in particular, deontics) and what he calls “high degree adjectives”. He treats them within a probability/utility framework as requiring degree standards much higher than the standards of their weak necessity counterparts. He does not, however, observe that strong necessity modals have the unique grammatical properties of extreme adjectives or make a connection to existing work on this class. We develop a scale-based analysis which integrates Morzycki’s ideas about extreme adjectives with treatments of necessity modals in premise semantics. Our analysis can explain their grammatical properties and it formalizes a pragmatic account of what it is to be “extreme”.

**Analysis.** Extreme adjectives are typically the upper-scale versions of relative open-scale adjectives (*big/huge*, *good/excellent*). Intuitively, they range over degrees that go beyond the normal or salient range of their scales. For a given scale  $S$ , a context  $C$  makes salient a subscale  $S_C = \langle D_C, \leq \rangle$ . The

extreme degrees, “off the salient scale”, belong to the extended set  $D_C^+$  in the scale  $S_C^+$  [Morzycki, 2012]. We propose that the scale of necessity  $N$  has the same structure.

Our formalization has two major components. First, we build on von Fintel and Iatridou’s [2008] proposal that weak and strong necessity modals differ in terms of two levels of ordering sources. Strong necessity modals make use of only the primary ordering source, while weak necessity modals make use of both the primary and secondary ordering sources. (We elaborate on the pragmatics of this choice below.) Second, we define degrees by considering alternative versions of an ordering source (given by  $h(o(w))$ , a set of non-empty subsets of  $o(w)$ ), where a proposition is **more necessary** than another when it is still necessary after **less important premises are dropped**. Putting these ideas together, we construct  $N_{C,w}$ , the non-extreme part of the scale, by considering subsets of the secondary ordering source, and  $N_{C,w}^+$ , the extended scale including the extreme part, by considering also an empty secondary ordering source and subsets of the primary:

(5)  $N_{C,w}$  is only defined if  $h(o_2(w))$  is defined for every world  $w$ . When defined,

$$\begin{aligned} D_C &= \{\{p : Best_{m(w), o_1(w), o'} \subseteq p\} : o' \in h(o_2(w))\} \\ \leq_C &= \{\langle d_1, d_2 \rangle : d_1, d_2 \in D_C \wedge d_1 \supseteq d_2\} \end{aligned}$$

(6)  $N_{C,w}^+$  is only defined if  $h(o_1(w))$  is defined, for every world  $w$ . When defined,

$$\begin{aligned} D_C^+ &= D \cup \{\{p : Best_{m(w), o', \emptyset} \subseteq p\} : o' \in h(o_1(w))\} \\ \leq_C^+ &= \{\langle d_1, d_2 \rangle : d_1, d_2 \in D_C^+ \wedge d_1 \supseteq d_2\} \end{aligned}$$

( $N_{C,w}$  and  $N_{C,w}^+$  are scales of necessity provided that  $\leq$  is a linear order; in the full paper, we also refine the definition of degrees to allow incompatible propositions to have the same degree.)

From this point, we build on a standard scale-based semantics [Kennedy, 2007]. The measure function of necessity  $\mu_N(p, w)$  returns, for any proposition  $p$ , the set of degrees which contain  $p$ . The lexical entries in (7) capture the two levels of strength: weak necessity modals are measures of propositions of non-extreme degree, whereas strong ones are restricted to extreme values [Morzycki, 2012]. The positive form results from combining (7) with the null morpheme *pos*.

$$\begin{aligned} (7) \quad (a) \quad \llbracket \square_{weak} \rrbracket^c &= [\lambda p \lambda w \lambda d : d \in D_C. d \in \mu_N(p, w)] \\ (b) \quad \llbracket \square_{strong} \rrbracket^c &= [\lambda p \lambda w \lambda d : d \in (D_C^+ - D_C). d \in \mu_N(p, w)] \end{aligned}$$

**Results.** Since degrees are sets of propositions ordered by  $\supseteq$ , our analysis derives the entailment relations between strong and weak necessity modals (2). By classifying necessity modals as extreme vs. non-extreme, we are able to capture a range of facts at issue in the empirical disputes between Lassiter and Klecha. For example, Klecha pointed out that only high probability phrases (*90%* but not *30%*) cooccur with *certain*; this makes sense if *30%* is never an extreme degree.

Assuming a standard scale-based analysis of comparative morphemes, our analysis accounts compositionally for the gradability properties exemplified in (1). We can also take over Morzycki’s (2012) explanations of the properties of extreme adjectives and modifiers. For example, *very* requires a degree in the non-extreme range, while *positively* requires one in the extreme range.

Our account allows us to explain the sense in which extreme degrees of necessity are “off the scale”, in Morzycki’s sense. We associate the difference between the extreme and non-extreme degrees with the pragmatic functions of primary and secondary ordering sources. Following Rubinstein [2012], the primary ordering source consists in premises which are contextually agreed-upon, while the secondary ordering source contains propositions which are potentially up for debate. Thus, by (5)-(6), the strong necessities would not normally need to be talked about, since they are judged to be necessary by all participants, and in this sense are not salient. In contrast, it is not settled in the context whether the weak necessities, i.e. the propositions which are only of non-extreme degree, are truly necessary, and this is what makes them salient. It is not easy to see how previous scale-based theories of modality would motivate a similar distinction.

**References.** von Fintel & Iatridou, 2008. How to say *ought* in foreign. Kennedy, 2007. Vagueness and Grammar. Klecha, 2012. Positive and conditional semantics for gradable modals. Lassiter, 2011. Measurement and modality. Morzycki, 2012. Adjectival extremeness. Paradis, 2001. Adjectives and boundedness. Rett, 2008. Degree modification in natural language. Rubinstein, 2012. Roots of modality.