The expression of Strong and Weak Necessity in Igbo: A simplified degree-based approach

Drawing on Igbo (Niger-Congo) data, we discuss a cross-linguistically novel pattern of coding weak and strong necessity. Igbo expresses strong necessity by combining necessity modals underspecified for strength with an intensifying modifier. Our data provide evidence for a degree-based modal semantics. Our formal analysis is inspired by, but different from, the gradable notion of modality in (Lassiter, 2017) and the account of weak and strong necessity in Portner & Rubinstein (2016).

Background: The literature discusses three strategies for expressing strong and weak necessity: (i) lexical coding (English *must* vs *ought*; von Fintel & Iatridou, 2008); (ii) the morphological derivation of weak necessity modals from strong ones (Javanese; Vander Klok & Hohaus, 2020); (iii) no formal distinction plus contextual resolution (Afrikaans, Samoan; Weingartz & Hohaus, 2024). The distinction has been formally modelled in terms of additional ordering sources in quantificational analyses (von Fintel & Iatridou, 2008), or in terms of positioning on a scale in multiple ordering source, degree-based frameworks (Portner & Rubinstein, 2016).

The Igbo data: Igbo exhibits a fourth pattern of coding weak and strong necessity: there are two underspecified necessity modals, *ga* (1) and *kwesi* (2), which allow for different modal flavors and express weak or strong necessity readings, depending on context. When combined with the intensifier *-rịrị*, they allow only for strong necessity readings in all modal flavors. *Kwesi* is the preferred choice in weak necessity contexts, but *ga* is also accepted in elicitations (data elicited with one speaker of the Ngwa dialect). *Ga* also doubles as the default future marker (Mucha et al., 2024).

(1) Mary **ga**(**-riri**) ị nọ na ụlọ.
Mary GA(-RIRI) INF be at home
'Mary should/must be at home'

(2) Mary **kwesi**(**-riri**) ị nọ na ụlọ.
Mary KWESI(-RIRI) INF be at home
'Mary should/must be at home'

(3) illustrates the intensifying nature of *-rịrị* with other intensional elements. In addition, *ga* is slightly stronger than *kwesi* (4): *ga... rịrị/ kwesi... rịrị* » *ga* » *kwesi*.

(3) A ma-**rịrị** m.
1SG know-RIRI 1SG
'I really know.'

(4) M **kwesi**-ri ị nọ. n'eziokwu m **ga** nọ (**rịrị**).
1SG KWESI-RV INF stay in.fact 1SG GA stay (RIRI)
'I should stay. In fact, I must.'

The problem and previous analyses: Analyses of the Igbo data must account for the flexible modal strength of *ga* and *kwesi* (with *ga* being slightly stronger) and the strengthening effect of the intensifier *-rịrị*. Mucha et al. (2024) present a quantificational analysis of the weak-strong distinction of *ga* and *ga... rịrị*: Plain *ga* is a universal quantifier whose quantificational domain is the intersection of a generalized modal base $\cap f$ and the normality set $\cap$NORM (Yalcin, 2016), both covertly represented in the syntax. When *-rịrị* is added, $\cap$NORM is replaced with the identity function over propositions. This causes a widening of the quantificational domain to $\cap f$ and results in a stronger statement. Their analysis faces the following problems: (i) plain *ga* is predicted to be more constrained, restricted to stereotypical or normal worlds, and the use of *-rịrị* with *ga* in such contexts should be rare, contrary to fact; (ii) it does not account for non-epistemic readings of *ga*; (iii) it remains silent on the meaning of *kwesi*.

Degree-based analysis: In view of these problems, we propose a degree-based analysis of weak and strong modality. It is inspired by, but differs in important ways from Portner & Rubinstein (2016). These authors observe that strong necessity modals can occur with extreme modifiers, in parallel to extreme adjectives: *'flat-out/downright must/excellent'*, whereas only weak necessity modals, same as non-extreme adjectives, are acceptable in comparative constructions. Portner & Rubinstein (2016) define a scale of necessity, where degrees are modeled as sets of propositions which are best according to the modal base, the primary ordering source, and a totally-ordered subset of the

secondary ordering source (for non-extreme part of the scale). The extreme part of the scale is constructed as an extension by considering subsets of the primary ordering source. Then, weak necessity modals are defined as measures of propositions of non-extreme degree, whereas strong N^+ ones are restricted to extreme values: $[\![N^+]\!]^c = \lambda p\, \lambda d\, \lambda w\, .\, d \in (D_w^+ - D_w) \wedge d = \mu_\Sigma(p, w)$. Apart from being technically quite involved, their analysis cannot capture the Igbo facts. In particular, (i) there are no extreme modifiers in Igbo (once *-rịrị* is present, no further intensifier is possible); (ii) it cannot account for the flexible strength of *ga* and *kwesi*, and (iii) there is evidence that *ga.../kwesi... rịrị* functions as a maximalizer denoting the unique maximal degree on the scale of necessities.

Proposal: In view of these problems, we propose a simplified degree-based analysis that can account for the Igbo facts. We derive modal degrees from a contextually-determined partial order on a Kratzerian (1981) ordering source, O. Modal degrees are no longer sets of propositions, but plain sets of worlds and the ordering between degrees corresponds to set size. Degree d is stronger than d' iff $d' \subset d$. If the ordering on O is $p > q > r$, then the ordering on degrees is $\{w : p(w)\} > \{w : (p \wedge q)(w)\} > \{w : (p \wedge q \wedge r)(w)\}$. If the ordering on O is $p, q > r$, then the ordering on degrees is $\{w : (p \wedge q)(w)\} > \{w : (p \wedge q \wedge r)(w)\}$ if $p \wedge q \neq \bot$. A proposition is necessarily true relative to a degree d if it is true at all worlds in d.

(5) Necessity relative to degree, d: $\Box_d$.
$[\![\Box_d(p)]\!] = 1$ iff for all $w \in d$, $[\![p]\!](w) = 1$ p is d-necessary iff p is true in every d-world

The underspecified necessity modals *ga* and *kwesi* denote a universal quantifier over degrees (= sets of worlds) with quantificational domain of varying size. The higher the degree (= the larger the set), the stronger the quantificational force. The resulting entry is parallel to that of vague adjectives like *tall* (e.g., $[\![\text{tall}]\!] = \lambda d.\lambda x.TALL(x) = d$ in Heim, 2000). To capture the slightly stronger nature of *ga* we introduce a degree-threshold value also familiar from adjective semantics. For set of degrees relative to O and context, c, $\Delta_{O,c}$:

(6) a. $[\![\text{kwesi}]\!]^{c,O} = \lambda d.\lambda p.\ \Box_d(p) \wedge d \in \Delta_{O,c}$
b. $[\![\text{ga}]\!]^{c,O} = \lambda d.\lambda p.\ \Box_d(p) \wedge d \in \Delta_{O,c} \wedge d \geq \Theta_c(\Delta_{O,c})$

In the absence of *rịrị*, the open degree argument is existentially closed, resembling the working of POS with vague adjectives in their positive form.

(7) a. $[\![\exists\text{-CL}]\!]([[kwesi]]^{c,O}) = \lambda p.\exists d.\ \Box_d(p) \wedge d \in \Delta_{O,c}$
b. $[\![\exists\text{-CL}]\!]([[ga]]^{c,O}) = \lambda p.\exists d.\ \Box_d(p) \wedge d \in \Delta_{O,c} \wedge d \geq \Theta_c(\Delta_{O,c})$

In contrast, the maximalizing intensifier *rịrị* maps to the maximal degree, thereby giving *ga/kwesi... rịrị* maximal modal strength.

(8) a. Max **on a set of degrees:** $\forall d \in \Delta_{O,c}.MAX(\Delta_{O,c}) = \iota d'.d' \geq d$
b. $[\![\text{-rịrị}]\!] = \lambda\mathcal{P}_{<d,<st,t>>}.\lambda p.\mathcal{P}(MAX(\Delta_{O,c}))(p)$
c. $[\![\text{ga -rịrị}]\!] = \lambda p.\Box_{MAX(\Delta_{O,c})}(p)$ (Trivially satisfied conjuncts suppressed)

Conclusion and outlook: The Igbo modal data provide strong evidence for a (simplified) degree-based analysis, which treats gradable adjectives and weak and strong necessity modals in parallel. The degree-based analysis directly extends to the intensional operator *chọ* 'want', which can also combine with *-rịrị* to express a maximal desire, but it raises new interesting perspectives on the meaning of the Igbo counterpart of 'to know' *ma* in (3): Since *ma* can also combine with *-rịrị* to express absolute certainty, it seems as if the concept of knowledge is a graded notion, at least in Igbo. It is a matter for further investigation whether this corresponds to different contextual standards for knowledge in the sense of Lewis (1996).

References

Heim, I. (2000). Degree operators and scope. In B. Jackson & T. Matthews (Eds.), *Proceedings of salt 10* (pp. 40–64). Cornell Linguistics Club.

Kratzer, A. (1981). The notional category of modality. In H. J. Eikmeyer & H. Rieser (Eds.), *New approaches in word semantics* (pp. 38–74). De Gruyter. https://doi.org/doi:10.1515/9783110842524-004

Lassiter, D. (2017). *Graded modality: Qualitative and quantitative perspectives*. Oxford University Press.

Lewis, D. (1996). Elusive knowledge. *Australasian Journal of Philosophy*, *74*(4), 549–567.

Mucha, A., Amaechi, M., Whibley, F., & Uegaki, W. (2024). Future and the composition of modal meaning: The view from Igbo [Published: December 20, 2024]. *Proceedings of Sinn und Bedeutung*, *28*, 647–665. https://doi.org/10.18148/sub/2024.v28.1151

Portner, P., & Rubinstein, A. (2016, June). Extreme and non-extreme deontic modals. https://doi.org/10.1093/acprof:oso/9780198717928.003.0010

Vander Klok, J., & Hohaus, V. (2020). Weak necessity without weak possibility: The composition of modal strength distinctions in Javanese. *Semantics and Pragmatics*, *13*(12), 1–55.

von Fintel, K., & Iatridou, S. (2008). How to say ought in foreign: The composition of weak necessity modals. *Time and Modality*, 115–141.

Weingartz, S., & Hohaus, V. (2024). Variable modal strength in Afrikaans and Samoan: Deriving strong necessity from weak necessity. *Proceedings of TripleA 10*.

Yalcin, S. (2016). Modalities of normality. *The Journal of Philosophy*, *113*(10), 607–638.