Color & lexicalized scalarity: edgless bounded scales, semantic representation of graded property scales, and innovative experimental backup (IA-based software developments).

Color adjectives pose several empirical challenges. Concerning lexical semantics, their behavior in gradability, aspect (e.g. boundedness), and interpretive and combinatorial restrictions, is not fully captured by endpoint-based scalar types including updated, finer-grained models with various differential criteria (Yoon 1996, Kennedy & Levin 2002). Analytical and experimental data from color-rooted adjectives and verbs point instead to a more intricate scalar structure with systematic consequences for categorization (set membership), distribution, property concept state and event structure. We study Italian and Spanish color predicates encoding stable, cross-linguistic chromatic foci such as *rojo/rosso* 'red', *azul/blu* 'blue', *verde* 'green', *amarillo*/giallo 'yellow' (vs. non-chromatic forms like *opaco* 'opaque', *transparente/trasparente* 'clear'), and root-sharing verbs extracted from large balanced corpora and ad-hoc (adapted) sentence prompts. Thus, color adjectives are used as primary diagnostics for scalar configurations, focusing on their behavior in a battery of standard, scalar-sensitive tests. These include: (i) major systematic, aspect-sensitive distributional patterns with quantifiers, (ii) comparative and equative constructions, (iii) polarity and NPI licensing, (iv) full/partial categorization, and (v) related calculation asymmetries (e.g. scalar boundedness (lexically-coded values acting as default scalar threshold, suggesting a completion sense independent of scalar edges). These tests are applied to same-rooted verbs in order to track how the underlying cutoff value projects into telicity, event homogeneity and resultativity.
We claim that, for a subset of adjectives and verbs like those lexically encoding chromatic foci—i.e., color roots—, degree estimation and categorization rely not on classically considered scalar edges (min/max elements) but on a different, rarely mentioned mid-scale cutoff, with a default absolute value located in the middle of the scale. This cutoff sets a root/encoded default categorization standard yielding coherent but previously under-recognized (apparent deviant) patterns in degree modification, scalar calculation, comparison and general aspect. Evidence mounts that these roots yield positive categorization even when the scalar value is not high enough to correspond to a max degree, but also fails to license positive categorization at min (just-over-zero) values. Such patterns contrast with earlier, finer grained analyses on lexical/semantic scalarity solely relying on scalar boundaries. **Proposal:** color-rooted adjectives and verbs encode a bounded edgeless scalar type, where the default threshold marking set-membership is collapsed around a focal mid-region rather than at the edges of the scale.
The idea dovetails with independent cognitive and neurocognitive research on color prototypes and focal points, where full membership in lexicalized color categories is reached at non-extreme degrees. By aligning this work with formal scalar typologies (absolute vs. relative adjectives, boundedness, and measure functions), the paper refines current classifications of possible lexically encoded scales. It shows that color roots provide evidence for mid-scale, focal thresholds that affect both adjectival distribution (e.g. with maximizers/minimizers, "barely / absolutely / perfectly" patterns, and comparison-class effects) and the event structure of deadjectival degree-achievement verbs, including the availability of telic readings once the mid-scale cutoff is reached. In doing so, the study illustrates how color predicates, traditionally central in work on conceptual and neural representations of hue, can also serve as a testing ground for enriching the inventory of scalar configurations allowed by lexical semantics, systematically encoded in natural languages across the board (Berlin & Kay 1978), and for tightening the links between lexical semantics, cognitive modeling and perception.

Experimental Study: To validate this hypothesis, we developed an AI-assisted web-based suite testing Spanish, Italian, and English speakers ($N=60$). Unlike standard naming tasks, our protocol included strict screening (digital Ishihara, lexical decision tasks) to exclude neurological or reading deficits, ensuring variance reflects semantic structure rather than cognitive noise.

Task 1: Modifier Applicability. Participants judged the acceptability (1-7 Likert) of adjective-modifier pairs (exactly/slightly/completely + COLOR) against stimuli in perceptually uniform space (CIELAB/HSL). We tested if "total" modifiers target the mid-scale prototype rather than the scalar limit.
Task 2: Aspectual Structure & The "Overshoot" Paradigm. To test the telicity of degree achievements (e.g., enrojecer), we introduced a dynamic "overshoot" paradigm. Participants viewed animations extending significantly beyond the theoretical prototype (e.g., from white to "burnt" hyper-saturated red) . Using a temporal scrubber, participants located the exact moment the event was "completed." Hypothesis: If the scale is mid-bounded, subjects will align telicity with the prototype, treating the "overshoot" as non-criterial, contrary to endpoint-bounded predictions.
Task 3: Fuzzy Boundaries. A timed binary categorization task mapped the decay of set membership at scalar edges to quantify semantic vagueness.

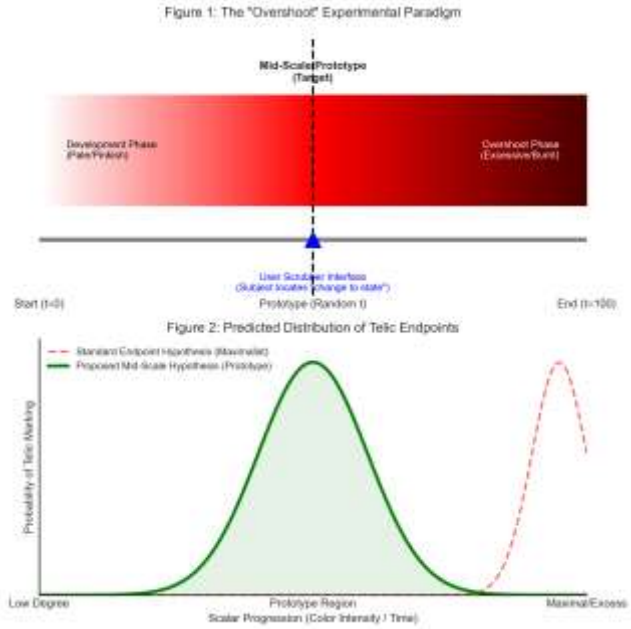

Figure 1: (Top) Schematic of the "Overshoot" Paradigm. The animation progresses from low saturation through the prototype to an excessive ("burnt") value. The "Scrubber" allows participants to retrospectively identify the onset of the state. **Figure 2:**(Bottom) Hypothetical Results. The dashed red line represents the prediction of standard scalar theories (endpoints define telicity). The solid green line represents our Mid-Scale Hypothesis, where telicity anchors to the prototype, treating the overshoot as non-criterial.

Participants: >40 participants completed the preliminary study. 3 were excluded for dyslexia or severe neurological conditions, not informing Spanish as native language, or for failing a basic psychometric-attention check including random checks during the experimental procedure (at the beginning, during the demographic input prompts, after the TVJ part of the study (Gordon 1996), at the end of the study, on whether they had answered seriously (Aust et al. 2013).

Results & Implications: Preliminary results indicate minimal variation supporting the mid-scale hypothesis. In the "Overshoot" task, participants consistently identified the telic endpoint at the prototypical value, disregarding further increases in saturation. This dissociates telicity (event culmination) from scalar maximality. Using standard diagnostics, we argue that color adjectives and verbs lexicalize a scalar configuration in which degree estimation (exemplar goodness) and categorization standards are linked to a default mid-scale threshold, rather than to minimal or maximal values usually seen in mainstream literature. Data from prototypicality and subjective membership-likelihood tasks show that color roots lexicalize a distinct scalar type with mid-scale absolute threshold values guiding aspectual behavior and property-concept attribution. Data shows that local color situations guide semantic processing, using a bounded but edgeless scale anchored to Prototypes, corresponding to CRPs in the conceptual semantic mapping.