

Children are more sensitive to the Recursive Set-Subset Ordering than to Adjective Ordering Restrictions.

Adina Camelia Bleotu & Tom Roeper*

Abstract. The current paper investigates experimentally whether, in a context requiring identifying *green leaves* out of a set of *long leaves*, Romanian 4-year-olds and adults choose to place the Color adjective closer to the noun than the Size adjective in accordance with a more rigid adjective ordering depending on the (type of) semantic property, or whether they choose to place the Set adjective closer to the noun than the Subset adjective, irrespective of the cognitive property specified by the adjective (Size or Color). We find that both Romanian adults and children are more sensitive to the Set-Subset distinction, preferring to refer to the subset of *green leaves* out of a set of *long leaves* through *frunzele lungi verzi* ‘the green long leaves’. We argue that adjectives are primarily ordered by a Recursive Set-Subset Ordering Constraint (RSSO), while orderings of adjectives in terms of properties such as Size and Color are cognitive.

Keywords. Romanian L1; adjectives; recursion; adjective ordering; sets; subsets

1. Introduction. In the current paper, we bring experimental evidence from Romanian 4-year-olds and adults that orderings of adjectives which reflect hierarchical structure and entail the recursive Set-Subset relation are stronger than universal crosslinguistic adjectival orderings which involve cognitive dimensions such as Size and Color. Multiple studies have focused on Adjective Ordering Restrictions (AORs) such as those in (1), placing Color adjectives closer to the noun than Size adjectives (1a), and not the other way round (1b):

- (1) the long green leaves
 ?the green long leaves

While some studies discuss this adjective ordering in cognitive terms (Scontras et al. 2017), other studies have argued that AORs are fixed structurally, and, as a consequence of the semantics-syntax mapping, Color and Size adjectives are ordered grammatically, i.e., adjectives specifying different dimensions are projected as Specifiers of distinct syntactic projections (Cinque 1994, 2005, 2010). We argue instead that the ordering of adjectives in terms of cognitive dimensions such as Size and Color is not primary in the grammar, but it is rather a matter of preference: Size is a more subjective property than Color, hence, it should be placed further away from the noun, being less defining (Scontras et al. 2017). In contrast, what seems to be fundamental for ordering adjectives is how adjectives establish sets and subsets, which we argue is an

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automatic reflex of recursive syntactic structure. Importantly, in a context where one needs to identify *the green leaves* out of a set of *long leaves*, in order to distinguish them from the *yellow leaves* in the same set, (1b) (*[green [long leaves]]*) becomes more adequate than (1a) (*[long [green leaves]]*). Moreover, in a context where one has to distinguish green leaves among long leaves from long leaves among green leaves, the Set-Subset relations are directly reflected in word order and the recursive hierarchical structure that can be entailed (*[green [long leaves]]* versus *[long [green leaves]]*). We examine experimentally the Set-Subset hierarchy versus the cognitive preference to position Color adjectives closer to the noun than Size adjectives by placing them in competition. We predict, following UG, that syntax must override cognitive preferences. We investigate both children and adults in order to see possible differences in their ordering of Set and Subset adjectives. Importantly, we examine Romanian, a Romance language where adjectives are generally postnominal, and where adjectives specifying different cognitive dimensions are ordered more freely (both the *Noun Color Adjective Size Adjective* order and the *Noun Size Adjective Color Adjective* order are allowed). If the syntactic preference to place Set adjectives closer to the noun than Subset ones is present nevertheless, this will show the important role of syntax in structuring Set-Subset semantics.

2. Do adjective orderings based on properties such as Size, Color, a.o. have a cognitive source, a grammatical source, or are they both cognitive and grammatical?

2.1. ADJECTIVES IN ENGLISH. Adjectives in English seem to attach themselves to nouns in a particular order depending on the properties they express: while (2a) is a natural word order, (2b), (2c), (2d) and (2e) are perceived as rather odd.

- (2) a. beautiful long green leaves
- b. ?beautiful green long leaves
- c. ?green beautiful long leaves
- d. ?beautiful green long leaves
- e. ?green long beautiful leaves

Adjective ordering restrictions (AORs) have been investigated in a variety of theoretical and experimental studies (e.g., Dixon 1982, Matthei 1982, Cinque 1994, 2005, 2010, Scott 2002, Bryant 2006, Scontras et al. 2017, a.o.). In an attempt to capture the empirical data, previous investigations made several proposals about how adjectives are ordered:

- (3) a. VALUE > DIMENSION > PHYSICAL PROPERTY > SPEED > HUMAN PROPENSITY > AGE > COLOR (Dixon 1982)
- b. SUBJECTIVE COMMENT > SIZE > LENGTH > HEIGHT > SPEED > WIDTH > WEIGHT > TEMPERATURE > AGE > SHAPE > COLOR NATIONALITY/ORIGIN > MATERIAL (Scott 2002)
- c. QUALITY > SIZE > SHAPE > COLOR > PROVENANCE (Sproat & Shih 1991)
- d. SUBJECTIVE > NON-SUBJECTIVE (Scontras et al. 2017)

The proposals make reference to semantic/cognitive properties at varying degrees of generality/specificity. Scott's (2002) ordering relies on a fine-grained classification of 13 cognitive categories, Dixon's (1982) ordering makes use of 7 cognitive categories, while Sproat & Shih (1991) employ 5 such categories. In contrast, Scontras et al. (2017) derives fine-grained orders such as those in (3a) on the basis of the notion of subjectivity, which he defines as *faultless disagreement*, i.e., the degree to which two opposite views can be correct at the same time with respect to an object. In his account, less subjective adjectives are placed closer to the noun, while

more subjective ones are placed further away from the noun. Consequently, evaluative adjectives such as *beautiful* will be positioned the furthest away from the noun in comparison to any other adjectives. Size adjectives will also be placed at a distance from the noun, as people can disagree about whether an object is big or not. Color is a more objective property than Size, which leads to placing Color adjectives closer to the noun than Size adjectives. People disagree more about the size of an object than its color. This leads to the ordering in (4), which has previously been exemplified through the sequence *beautiful long green leaves* (2a).

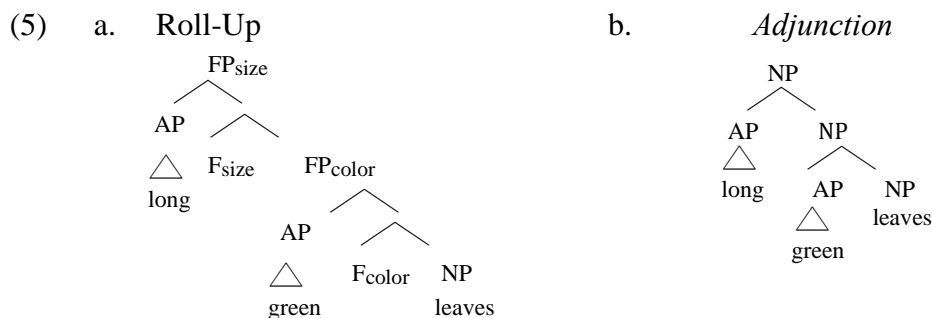
(4) Quality > Size > Color > N

Several stances can be taken with respect to the AORs presented above:

- (i) *A Cognitive Approach*: AORs are cognitive, but not grammatical
- (ii) *A Grammatical Approach*: AORs are grammatical, but not cognitive
- (iii) *A Hybrid Cognitive-Grammatical Approach*: AORs are both cognitive and grammatical

According to the *Cognitive Approach*, the ordering of adjectives is purely cognitive in nature. It is not fixed in syntax, which means that it allows for a certain degree of variance. While some AOR preferences are very clear, such as placing evaluative adjectives further away from the noun than Color adjectives, other adjective orderings are more variable. Such is the case for Shape and Color Adjectives. A google search conducted by Truswell (2004), as well as corpus studies and experimental work by Scontras et al. (2017) show that adult English speakers opt for the order Shape > Color half of the time and for the order Color > Shape the other half. Moreover, a study by Grohe & Shulz (2021) shows that children vary in how they order Shape and Color adjectives more than with Size and Shape adjectives. Such findings seem to suggest that (at least certain) AORs are a matter of cognitive reasoning rather than of fixed syntax.

According to the *Grammatical Approach*, the ordering of adjectives has a grammatical source. In cartography, each adjective type is projected as the specifier of a syntactic projection dedicated to a particular meaning (Cinque 1994, 2005, 2010). To give just an example, in a cartographic representation of the ordering of Size adjectives and Color adjectives, Color adjectives are merged earlier than Size adjectives. Both appear as Specifiers of dedicated projections (5a).



In Adjunction Theory (Abels & Neeleman 2010, Kremers 2003), adjectives in English are adjoined to the left of the noun (5b). Several problems arise with the grammatical approach, be it cartographic or adjunction. On the one hand, it is unclear on what grounds one can decide upon the exact number of adjectival projections needed, given the high number of properties they specify. It is also unclear how fine-grained the ordering should be, and what the represented properties should be exactly. Moreover, such a structural implementation does not explain well the variability in the ordering of some adjectives. If participants vary in their ordering of Color and Shape adjectives, this would imply that the syntactic hierarchy varies also, sometimes

placing Color above Shape and sometimes Shape above Color. This structural flexibility would go against the idea of a fixed hierarchical syntax¹.

Another possible account for AORs is the *Hybrid Cognitive-Grammatical Approach*, arguing that AORs are both cognitive and grammatical. According to Scontras et al. (2019), successful reference resolution requires less subjective adjectives to merge earlier with the noun than more subjective ones.

These accounts make different predictions about how adult speakers should behave in contexts that challenge the adjective orderings considered natural, such as contexts where speakers have to refer to the subset of green leaves out of a set of long leaves.

If AORs are cognitive, then, if they want to identify the green leaves among the long leaves, they should be able to refer to them through the expression *the green long leaves*.

If, on the other hand, AORs are grammatical or grammatical and cognitive, adult speakers should avoid using *the green long leaves* regardless of the context. Hence, even if *the green long leaves* would pick the green leaves out of the long leaves, speakers should instead go for the natural order *the long green leaves*, where Color adjectives are placed closer to the noun than Size adjectives.

As far as children are concerned, it is not fully clear how they would behave in contexts that go against natural orders of properties. However, previous experimental and corpus work seems to suggest that they do not have strong preferences for certain adjectival orders based on properties such as Size, Color, a.o. until around 4-5. In a repetition task, where children had to repeat unnatural adjective orders like *the plastic large pencil* (Bever 1970), young children between ages 2 and 5 did well, unlike adults, who had difficulties. In a production task with 3- and 4-year-olds, Martin & Molfese (1972) showed that, unlike adults, children placed adjectives denoting Cleanliness closer to the noun than Color adjectives (*small yellow clean house*). Moreover, Hare & Otto (1978) had children in grades one through five arrange three adjectives of Size, Color, and Material with a noun to create adjective phrases that they thought were adequate. The results suggest a developmental effect: the older the children, the more adult-like their performance. A corpus study by Lee et al. (2018) shows that children start ordering adjectives based on semantic classes around age 4. A recent elicited production task by Grohe & Schulz (2021) reveals that children place Size adjectives further away from the noun than Shape adjectives to a lesser extent than adults. Moreover, children seem to prefer Shape adjectives closer to the noun than Color adjectives, while adults do not seem to exhibit a preference with respect to the ordering of Shape-Color adjectives. Such findings from language acquisition can be taken to indicate that AORs based on properties like Size, Color, a.o. have a cognitive source rather than a grammatical source, given that, if cognitive AORs were syntactically fixed in UG, we would perhaps expect young children to perform in a more adult-like manner from earlier on. Given children's flexibility with ordering Size, Color, a.o. types of adjectives, we expect that they might not find

¹ An alternative grammatical account to hierarchical syntax would be a parallel structure for coordinated elements (Goodall 2007), which would make all items equal and would make adjective re-ordering possible. Coordinated parallel structure provides no syntactic restrictions. Hence, all kinds of cognitive and pragmatic factors can influence order, such as the importance of certain dimensions to the speaker or visual salience. The silent coordination between adjectives could act similarly to the conjunction *and* in discourse, which allows all kinds of situational inferences (e.g., in *John lost the race and went home angry*, we infer a *because* as part of the conjunction).

it so hard to diverge from ‘natural’ orders, if the context requires it. This will, of course, also depend on how sensitive they are to the distinction between sets and subsets. Nevertheless, we do not expect an unstable preference to override contextual requirements to refer to subsets.

2.2. ADJECTIVES IN ROMANIAN. While there is a general consensus that adjectives have a fixed order in English, matters are more complicated for a Romance language like Romanian. In Romanian, adjectives occur to the right of the noun, and, in addition, they inflect for number and gender (see 6). Romanian thus differs from English, where adjectives occur on the left of the noun and do not inflect morphologically for either number or gender.

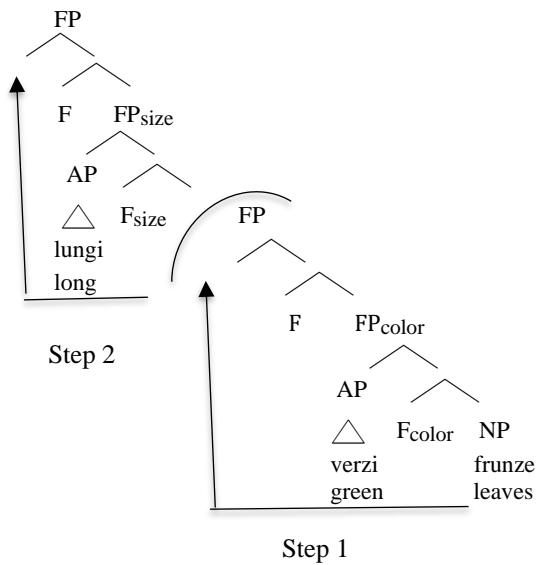
However, it is not so clear how multiple adjectives are ordered in Romanian as compared to English. Two opposite viewpoints exist in the literature. On the one hand, it has been argued that, in Romance languages, Romanian included, adjectives appear as a mirror order of English (Cinque 1994, 2005, 2010, Scontras et al. 2017). Thus, the order [*Size Adjective Color Adjective N*] in English becomes the order [*N Color Adjective Size Adjective*] in Romanian.

- (6) a. beautiful long green leaves
b. frunze verzi lungi frumoase
leaf.FPL green.FPL long.FPL beautiful.FPL
‘beautiful long green leaves’

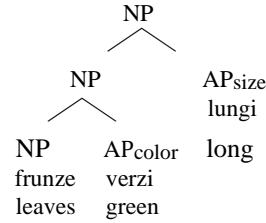
While the mirror effect can receive a cognitive explanation in terms of subjectivity, it can also be accounted for syntactically (Nevins 2011). One possible account is Roll-Up, a succession of movement operations resulting in the reverse order of adjectives in Romanian (Cinque 1994, 2005, 2010). In (7), the NP moves out of its position to an outer specifier of FP_{color} (Step 1), the newly formed FP containing FP_{color} moves out of its position to the outer specifier of the next FP_{size} (Step 2). Another possible account is that adjectives are left-adjoined in English, but they are right-adjoined in Romanian (Abels & Neelman 2010, Kremers 2003).

On the other hand, it has been claimed that, contrary to English, Romanian has a freer ordering of adjectives (Cornilescu & Giurgea 2013, Cornilescu & Nicolae 2016, Cornilescu & Cosma 2019), just like Greek (Leivada & Westergaard 2019) or Hebrew (Trainin & Shetreet 2021). While there are some general ordering preferences for placing evaluative adjectives further away from the noun than more (objectively) descriptive adjectives, Romanian seems to generally be more flexible. This is confirmed by experiments conducted by Trușcă & Bleotu (to appear) and Luciu & Bleotu (to appear). By means of a Likert acceptability judgment task (Trușcă & Bleotu to appear) and a forced choice task (Luciu & Bleotu to appear), the authors look comparatively at how Romanian and British adult speakers order various adjective types. They find that, unlike in British English, where adjective orders seem to observe a fixed hierarchy, in Romanian, adjectives seem to allow for a more flexible order. Romanian native speakers seem to equally accept both Color-Size and Size-Color adjectival orders (8 a, b).

(7) a. *Roll-Up*



b. *Adjunction*



(8) a. *Size-Color (English)*
Don't press the big red button!

a'. *Mirror Size-Color (Romanian)*
Nu apăsa butonul roșu mare!
not press.IMP button.the red big
'Don't press the big red button!'

b. *Color-Size (English)*
Don't press the red big button!

b'. *Mirror Color-Size (Romanian)*
Nu apăsa butonul mare roșu!
not press.IMP button.the big red
'Don't press the red big button!'

Given that adjectives expressing different cognitive dimensions are more freely ordered in Romanian, we expect speakers (both children and adults) to show even more sensitivity to contexts requiring identifying Subsets within Sets in Romanian than in English. In English, the Set-Subset Preference has to win over a very strong, fixed cognitive AOR, whereas in Romanian, the cognitive AOR preference seems to be weaker.

3. What is the source of adjective orderings based on the Set-Subset properties? While most of the research on AORs focuses on how adjectives are ordered depending on the cognitive properties they express, we would like to propose that there is another constraint at work according to which adjectives are ordered, a constraint which takes into account whether an adjective helps pick out a Set or a Subset.

Experimental studies in English (Foucault et al. 2022) and Romanian (Bleotu & Roeper 2021a, b) have investigated recursive adjectives such as *small big mushrooms* or *flori mari mici* (i.e. 'flowers big small', meaning 'small big flowers'). They show that, in contexts involving referring to subsets within sets, adults understand the adjective closest to the noun as referring to the Set and the subsequent adjective as referring to the Subset. *Small big mushrooms* is thus interpreted as picking out the small mushrooms out of the set of big mushrooms. Not only are adults sensitive to the Set-Subset distinction in comprehension, but they also show sensitivity to it in production, consistently placing Set adjectives closer to the noun than Subset ones, when

asked to name various entities. Based on such findings, we propose *The Recursive Set-Subset Ordering Constraint (RSSO)*:

(9) *The Recursive Set-Subset Ordering Constraint (RSSO)-A Hierarchical Perspective*

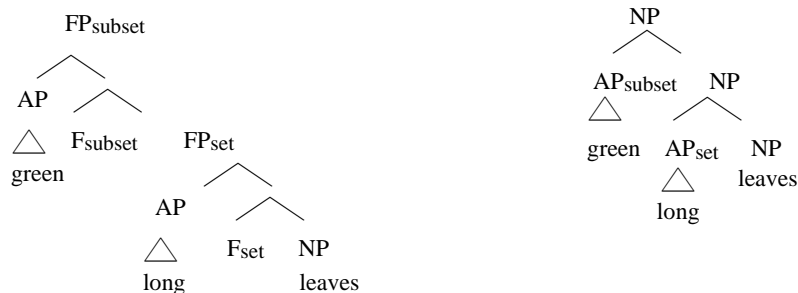
In a context requiring identifying a subset within a set, the adjective specifying the Subset is higher in the tree than the adjective specifying the Set.

Importantly, we know it is the structure that determines the Set-Subset relation not the linear order, because we can get the opposite linear order with the same hierarchical relation as in (10), where the Subset adjective *green* occurs to the right of the Set-denoting object *long leaves*:

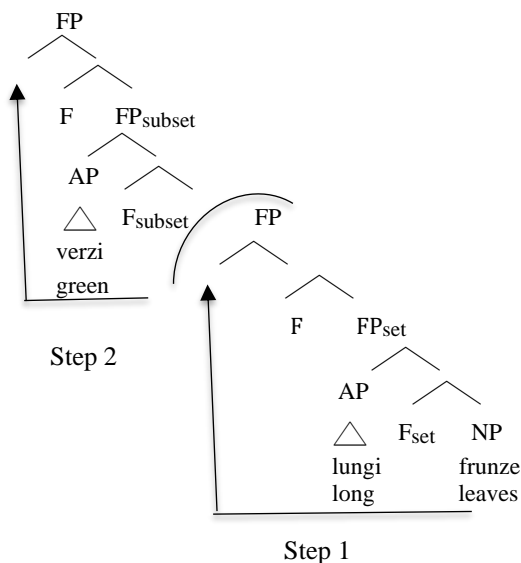
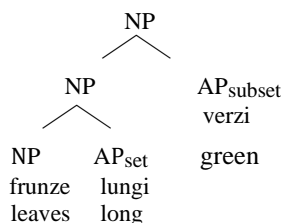
(10) I consider the long leaves green.

We argue that the RSSO is a constraint at the syntax-semantics interface of UG, which maps the Set-Subset semantics onto the syntax, by first merging Set adjectives with the noun and then the Subset adjectives. To derive an order where *long* helps pick out the Set and *green* helps pick out the Subset, we suggest several possible syntactic implementations of this constraint in cartography or in a theory of adjunction, both in English (11) and Romanian (12). In English, adjectives are merged to the left of the noun: Set adjectives are merged first, followed by Subset adjectives. One can merge adjectives as Specifiers of special functional projections dedicated to Set and Subset properties (11a), taking inspiration from the cartographic approach of Cinque (1994, 2005, 2010). One can also simply assume Set and Subset adjectives are successively merged to the left as modifiers of the noun (11b).

(11) a. *Cartographic Approach* b. *Adjunction* (English)



In Romanian, adjectives are merged to the right of the noun. Interestingly, while Romanian does not seem to show a mirror order of English for orderings of adjectives in terms of cognitive-semantic properties, it does show a mirror order of English for Set-Subset adjectives. This claim is supported by experimental results from Foucault et al. (2022) for English and Bleotu & Roeper (2021a, b) for Romanian. In order to explain this mirror effect, we can assume a complex Roll-Up operation (Cinque 1994, 2005, 2010). (12a, b) show possible derivations of *frunze lungi verzi* ('leaves long green', meaning 'green long leaves'), where *lungi* 'long' picks out the Set and *verzi* 'green' picks out the Subset. In (12a), the NP moves out of its position to an outer specifier of FP_{set} (Step 1), the newly formed FP containing FP_{set} moves out of its position to the outer specifier of the next FP_{subset} (Step 2). Another possible account is adjunction (Abels & Neeleman 2010, Kremers 2003): successively adjoining Set and Subset adjectives to the right of the noun, as in (12b).

(12) a. *Roll-Up*b. *Adjunction* (Romanian)

Interestingly, children seem to be less sensitive to the Set-Subset distinction than adults, often understanding recursion as coordination (Roeper 2011, Sevcenco et al. 2017, Sevcenco & Avram 2018) and avoiding using it in production. However, in previous research by Foucault et al. (2022) and Bleotu & Roeper 2021(a, b), the adjectives tested for specified the same dimension, which may have led to further challenges for children. Sequences such as *small big mushrooms* may lead to interpretations that are in fact contradictory in a conjunctive syntax, where *mushrooms* are understood to be both small and big. Thus, it becomes impossible to tease apart whether children have difficulties with such recursive adjectives because of the RSSO or because of the semantic complexity of the adjectives at stake (Weicker 2019), which both specify the same gradable dimension, Size. Investigating adjectives specifying different dimensions (Color, Size) removes this problem, offering us insight into whether children have a general difficulty with RSSO independently of whether the adjectives used. Previous work by Matthei (1982) and Bryant (2006) on the comprehension of sequences such as *the second green ball* or *big black balls* suggests that young children prefer coordinative interpretations such as ‘the second and the green ball’ or ‘big and black balls’ over recursive interpretations. However, it is not clear whether they would display a similar preference in production. Moreover, it is unclear they would do so in a context which makes the difference between the Set and the Subset clear. In a context requiring picking out the *green leaves* out of the *long leaves*, children may show sensitivity to the Set-Subset if asked to pick between two expressions: *the long green leaves* and *the green long leaves*. Importantly, linguistic and visual contrasts have been shown to boost performance in children (Bleotu 2021).

Given that AOR preferences are not so strong in Romanian either for adults or for children, we expect both groups to order adjectives according to the RSSO, irrespective of the cognitive dimension of the adjectives (Size, Color). Thus, we propose the *Set-Subset Hypothesis* in (13):

(13) *Set-Subset Hypothesis*

If RSSO functions as a fundamental principle of UG, then compositional interpretation of hierarchical structure must overrule cognitive AOR preferences.

4. Experiment. We investigate the Set-Subset Hypothesis experimentally, exploring whether Romanian 4-year-olds and adults are more sensitive in ordering adjectives to cognitive properties such as Size and Color, or to Set-Subset properties.

4.1. PARTICIPANTS. A test group of 17 Romanian monolingual TD (Age range: 3;2-5, Mean age: 4;35, M=8, F=9) and a control group of 17 adults took part in the experiment.

4.2. PREDICTIONS. We predict that, if RSSO is primary, then, in a context requiring identifying entities through reference to sets and subsets, participants will choose to place Set adjectives closer to the noun than Subset ones, regardless of the cognitive property expressed by the adjective (Color, Size) and regardless of whether the RSSO order would end up placing Size adjectives closer to the noun than Color ones. If, however, ordering adjectives in terms of cognitive properties is stronger than contextual needs, we expect participants to always choose the order $N A_{Color} A_{Size}$, regardless of Set-Subset considerations. Considering that Romanian seems to order adjectives quite freely on cognitive grounds, participants are more likely to observe RSSO if the context requires it. However, children may be less sensitive to Sets-Subsets than adults.

4.3. PROCEDURE. The experiment employed a forced choice preferential naming task, where participants were presented with a picture containing several items (some of which are circled), and they had to choose from two options how they would name the circled items. There were two types of pictures: a) a picture depicting three groups of items of the same color, but a different size, and b) a picture depicting three groups of items of the same size, but a different color (see Figures 1, 2). The pictures employed flowers, leaves, giraffes, squirrels. Participants could choose between two different orders: $N Color Adjective Size Adjective$ or $N Size Adjective Color Adjective$ (see (14) and (15)).

Two contexts were tested: one context where the RSSO is in harmony with cognitive AORs (i.e., AORs in terms of the cognitive properties expressed by the adjectives), in which case participants saw Figure 1 and heard the text in (14), and one context where the RSSO is in conflict with cognitive AORs, in which case participants saw the Figure 2 and heard the text in (15) (both texts have been translated from Romanian into English except for the critical part involving the choice between the two name options):

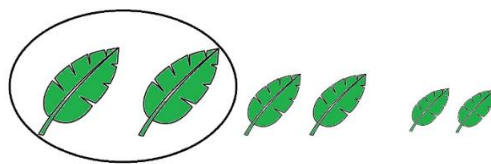


Figure 1. Example item for RSSO in harmony with cognitive AORs

(14) “Let’s look at these leaves! They are all green. Some are long, some are medium size, and some are short. The circled leaves are:

<i>frunze verzi lungi</i>		<i>frunze lungi verzi ?”</i>
leaves green.FPL long.FPL	or	leaves long.FPL green.FPL
‘long green leaves’		‘green long leaves’

Expected answer: *frunze verzi lungi*
leaves green.FPL long.FPL
‘long green leaves’

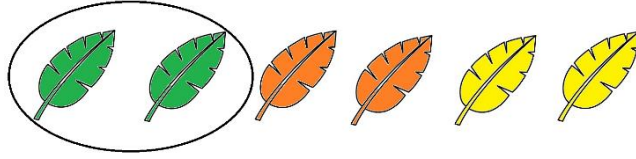


Figure 2. Example item for RSSO in conflict with cognitive AORs

(15) “Let’s look at these leaves! They are all long. Some are green, some are orange, and some are yellow. The circled leaves are:

<i>frunze verzi lungi</i>		<i>frunze lungi verzi ?</i>
leaves green.FPL long.FPL	or	leaves long.FPL green.FPL
‘long green leaves’		‘green long leaves’

Expected answer: *frunze lungi verzi*
 leaves long.FPL green.FPL
 ‘green long leaves’

4.4. RESULTS. Children’s behavior was significantly similar to adults, revealing sensitivity to properties identifying the Set-Subset Hierarchy (see Figure 3). Regardless of the cognitive property expressed by the adjective (Color or Size), participants placed Set adjectives closer to the noun than Subset ones. Therefore, in a context requiring identifying green leaves out of a set of long leaves of various colors, children and adults preferred to name them *frunze lungi verzi* ‘green long leaves’. Since *frunze verzi lungi* ‘long green leaves’ would be more natural if one considered cognitive properties exclusively (Scontras et al. 2017), the participants’ answers indicate their sensitivity to the RSSO.

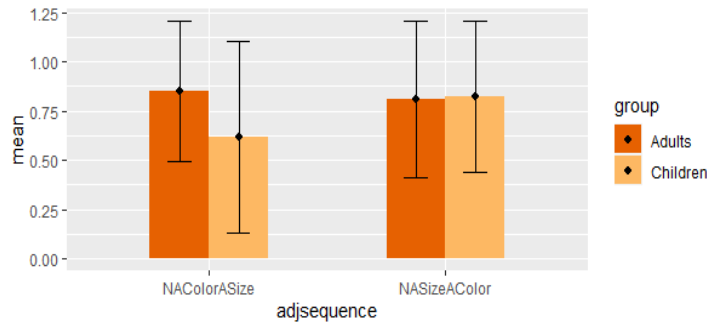


Figure 3. Accuracy per expected order

In terms of individual responses, 15 children out of 17 and 13 adults out of 17 were consistent. We fitted a mixed effects model in R (2021) with Order (Size-Color, Color-Size) as a dependent variable, Group (children/ adults), Conflict (Conflict between RSSO and the cognitive AOR, No Conflict between RSSO and the cognitive AOR), the interaction between Group and Conflict as fixed effects, and random slopes per items (flowers/leaves/ squirrels/giraffes) and participants. We find a significant effect per Conflict ($\beta = -4.6745$, $SE = 1.504$, $Z = -3.108$, $p = 0.0018 < .05$), but no significant effect per Group ($p > 0.05$), or the interaction between Group and Conflict ($p > .05$). This shows that both Romanian children and adults vary their naming preferences depending on whether there is conflict between RSSO and the cognitive AOR.

5. Discussion. Romanian children and adults are more sensitive to the Set/Subset distinction than to the Color/Size distinction. We take this to suggest that AORs in terms of properties such as

Size and Color are cognitive, but not syntactic. The fact that the ordering of Color and Size adjectives is not encoded in the grammatical structure of UG explains the variability we often find in the adjective orders preferred by speakers in Romanian (Luciu & Bleotu, to appear; Trușcă & Bleotu, to appear). If notions such as Set and Subset are irrelevant in a particular context, then it makes no difference whether a speaker utters (16a) or (16b), because, essentially, they both convey the same information, namely, that the leaves are both green and long. Therefore, in such contexts, (16a) and (16b) receive a coordinative reading: cognitive AORs operate on the conjunction between *verzi* ‘green’ and *lungi* ‘long’ (see Table 1). While one could argue for possible differences between *lungi și verzi* ‘long and green’ and *verzi și lungi* ‘green and long’, in terms of a feature being more relevant than another (for instance, ‘long and green’ could be taken to mean ‘first and foremost, long, and, secondly, green’), we here assume near synonymy between the two coordinative structures.

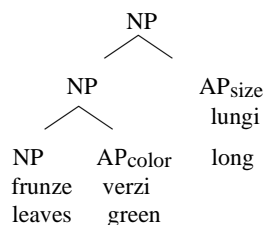
- (16) a. *frunze verzi lungi*
 leaves.FPL green.FPL long.FPL
 ‘long green leaves’
 b. *frunze lungi verzi*
 leaves.FPL long.FPL green.FPL
 ‘green long leaves’

Example	Coordinative interpretation	Recursive interpretation
<i>frunze verzi lungi</i> leaves green.FPL long.FPL ‘long green leaves’	<i>frunze [verzi și lungi]</i> leaves [green and long] ‘[green and long] leaves’	<i>[[frunze verzi_{Set}] lungi_{Subset}]</i> [[leaves green _{Set}] long _{Subset}] ‘[Subset long [Set green leaves]]’
<i>frunze lungi verzi</i> leaves long.FPL green.FPL ‘green long leaves’	<i>frunze [lungi și verzi]</i> leaves [long and green] ‘[long and green] leaves’	<i>[[frunze lungi_{Set}] verzi_{Subset}]</i> [[leaves long _{Set}] green _{Subset}] ‘[Subset green [Set long leaves]]’

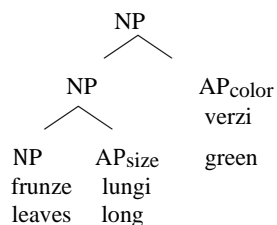
Table 1. Possible interpretations of sequences of two adjectives in Romanian

Importantly, Romanian seems to be more flexible in its ordering of adjectives specifying different semantic dimensions. Consequently, in order to account for the coordinative reading of (16a, b), we give up on Roll-Up (Cinque 1994, 2005, 2010) as an explanation and opt instead for an adjunction analysis (Abels & Neeleman 2010, Kremers 2003), allowing for more freedom in the ordering of its adjuncts, as in (17a, b).

- (17) a. *Adjunction* (for (16a))



- b. *Adjunction* (for (16b))



In contrast, in contexts where the distinction between Sets and Subsets is relevant, (16a) and (16b) are not synonymous: (16a) picks out the subset of long leaves out of the set of green leaves, while (16b) picks out the subset of green leaves out of a set of long leaves. In this particular case, (16a) and (16b) receive recursive interpretations, not coordinative ones (see Table 1).

of adjectives. This constraint is a fundamental UG principle which maps the Set-Subset semantics onto syntax through the operation of Merge: Set adjectives are merged first to the noun, followed by Subset adjectives. Importantly, this principle seems to override even adjective ordering preferences based on cognitive properties such as Color, Size, a.o. In a context where Romanian children and adults have to choose between observing the RSSO and observing cognitive AORs, both choose to order adjectives based on Set-Subset considerations. However, given that Romanian is a language which allows a freer order of adjectives specifying cognitive properties, these results may not be so unexpected. In future studies, in order to establish the explanatory power and strength of RSSO, we aim to investigate whether the RSSO will override AORs in a language like English, where AORs based on cognitive properties are more fixed.

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