HOW ARE SIZE, AGE, SHAPE, AND COLOR ADJECTIVES ORDERED IN ENGLISH AND ROMANIAN? AN EXPERIMENTAL INVESTIGATION

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Abstract: The current study investigates experimentally whether the General Adjective Hierarchy Size > Age > Shape > Color holds for British English and Romanian native speakers alike, and whether Romanian exhibits a mirror order of English, as argued in Cinque (1994, 2005, 2010) or whether Romanian exhibits a more flexible ordering than English (Cornilescu & Nicolae 2016, Cornilescu & Cosma 2019, Leivada & Westergaard 2019). The results from a forced choice task conducted both in British English and Romanian support the idea that English observes the fixed hierarchy Size > Age > Shape > Color overall, while Romanian is more flexible in its ordering. These results go against Cinque's (1994) cartographic theory that Romance is a mirror of English, as well as against Scontras et al.'s (2017) theory of subjectivity; instead, the results may be captured by free adjunction. Our findings for English and Romanian support the idea that certain languages (like English) observe general hierarchies for adjectives, while other languages (like Romanian) do not.

Keywords: English, Romanian, adjectives, adjective hierarchy, adjectival orders, adjunction, experimental linguistics

1. Introduction

The aim of this paper is to investigate experimentally how Size, Age, Shape, and Color adjectives are ordered in British English and Romanian. More specifically, we test whether participants order adjectives in line with the General Adjective Hierarchy Size > Age > Shape > Color (Hetzron 1978, Dixon 1982, Cinque 1994, Scott 2002, Cinque 2005, 2010, Scontras et al. 2017, 2019) or not. Previewing the results, we find that British English native speakers abide by adjective ordering restrictions (AORs), while Romanian native speakers employ a more flexible ordering of adjectives.

The roadmap for the paper is as follows: after presenting the aim of the paper in Section 1, in Section 2, we present some general background on adjective orders in English and Romanian. In Section 3, we present the current experiments investigating adjectival orders in English and Romanian. In Section 4, we discuss the experimental results, while in Section 5, we draw the conclusions of our experimental research.

2. Overview

2.1 Overview of studies on adjective orders in English

Over the years, the idea that there is a strict adjective order in English has proved popular in the linguistic community. Many, if not all English speakers (including L2

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Bucharest Working Papers in Linguistics XXVI, 1, 69-86, eISSN 2392-8093, ISSN-L 2069-9239
DOI: 10.31178/BWPL.26.1.4

speakers) would agree that (1a) is a more natural sentence when compared to (1b), and the same can be said about (1c) when compared to (1d):

(1) a. She has a big old table.
b. She has an old big table.
c. I want the little red book.
d. I want the red little book.

Adjective Ordering Restrictions (AOR) can sometimes be overridden in exceptional cases such as adjectives that are homophonous with reduced relatives, comma intonation, adjectives that bear focus (see 2), operator adjectives (ex: *formerly, alleged*), non-definite superlatives, a.o. (see Teodorescu 2006).

(2) a. She wants an OLD big table.
b. I want the RED little book.

Nonetheless, while we acknowledge that there are certain exceptions to AOR, preferences are still found in most cases as argued by a wide array of linguistic studies (Hetzron 1978, Dixon 1982, Cinque 1994, Scott 2002, Cinque 1010, Scontras et al. 2017, 2019, a.o.). Various generalizations about adjective orderings have been proposed, for example:

(3) a. EVALUATING > SIZE > COLOR (Hetzron 1978)
b. VALUE > DIMENSION > PHYSICAL PROPERTY > SPEED > HUMAN PROPENSITY > AGE > COLOR (Dixon 1982)
c. SUBJECTIVE COMMENT > SIZE > LENGTH > HEIGHT > SPEED > WIDTH > WEIGHT > TEMPERATURE > AGE > SHAPE > COLOR > NATIONALITY/ORIGIN > MATERIAL (Scott 2002)
d. DIMENSION > VALUE> AGE > PHYSICAL SHAPE > COLOR > MATERIAL, i.e. MORE SUBJECTIVE ADJECTIVES > LESS SUBJECTIVE ADJECTIVES (Scontras et al. 2017)

There are many theories about why AORs arise, and what factors may influence them: syntactic theories, as well as cognitive-semantic, frequency-based or informational gain/loss theories. We start by discussing the syntactic theories (cartographic account, adjunction account). According to Cinque (1994), AORs have a syntactic source, with adjective phrases being generated in the [Spec, XP] of multiple projections rather than adjoined. Cinque (1994) thus proposes a cartographic approach to AORs, claiming that adjectives are base generated to the left of the nominal head (as in English) and ordered syntactically in a fixed order. Nevertheless, while claiming AORs are rigid, he acknowledges that they may be violated when adjective phrases are asyndetically coordinated, and when a marked interpretation is needed. Importantly, Romance and Germanic languages are closer than it may seem at first sight: AORs are essentially the same in consistently NA and AN languages, with Romance languages representing a mirror order of AN languages (see subsection 2.2 for a more elaborate discussion of this claim).

An alternative syntactic account to the cartographic approach is the adjunction account (Kremers 2003, Abels & Neeleman 2010), according to which adjectives are XPs adjoined to nouns: in languages such as English, where adjectives precede nouns, adjunction is to the left of the noun, whereas in languages such as Romanian, where nouns (typically) precede adjectives, adjunction is to the right of the noun. In Cinque's view, adjunction cannot explain the fixed adjectival order in English, as adjunction of XPs may occur in any order. Such an account may, however, work if one assumes a more rigid sequence of adjunction. While the (free) adjunction account may be problematic for English, where most of the literature seems to agree on the AOR being fixed, it may explain the more flexible adjectival order in languages such as Romanian (Cornilescu & Cosma 2019, Cornilescu & Giurgea 2013, Cornilescu & Nicolae 2016), Greek (Leivada & Westergaard 2019), or Hebrew (Trainin & Sheetreet 2021).

Another theory claims that AORs are cognitive-semantic. According to Scontras et al. (2017), they are derived from general properties of cognition, in particular subjectivity. The adjectival order listed in (3d) is based on corpus analysis, as well as results from an experiment combining adjectives from seven different semantic classes in two-by-two pairs. Importantly, subjectivity was found to matter for AOR. The authors measured subjectivity by means of two tasks: in the first task they asked participants to judge the subjectivity of an adjective on a Likert scale, in the second task, they asked participants if two opposite views can be correct at the same time with respect to an object (faultless disagreement). They found that, overall, subjectivity accounts for over 70% of the variance, while frequency and length also play a small part (e.g. the fact that *entrepreneurial* tends to appear closer to the noun may be explained in terms of its bigger length compared to other adjectives). Importantly, adjectives that are further away from each other on the subjectivity scale in (3d) (such as dimension and color adjectives) seem to be arranged in a very clear order, while adjectives that are closer to each other on the subjectivity scale (such as shape and color adjectives) may be arranged flexibly (see Grohe & Schulz 2022). The existence of AOR shows that linguistic universals derive from cognitive universals. Scontras et al. (2019) criticize Cinque's approach, pointing out to the fact that a syntax that allows only one ordering for any string of adjectives is too rigid. According to the authors, a fixed structural hierarchy would predict categorical ordering preferences. However, they found graded judgments that track differential subjectivity. Moreover, according to the authors, a syntactic approach fails to explain the ultimate reason why the nodes arrange in the order of subjectivity. In contrast, their approach relates AORs to an increase in the probability of communicative success (Franke et al. 2019): ordering with respect to subjectivity minimizes the probability of misclassifications for multi-adjectival strings and increases the accuracy in referent identification.

A similar proposal to Scontras et al. (2017, 2019) has been made for German by Kotowski & Härtl (2019), who argue on the basis of a German corpus that the only hard constraint is between object- and kind- modification, while other factors such as notional class, weight, frequency simply represent norm-based preferences rather than imposing rigid rules.

A third possible account of AORs is frequency-based (Champollion 2006). According to Champollion (2006), all adjective orderings are possible (there are no strict

rules), but some are disfavored due to higher cost. He argues that semantics plays an important role in AORs, and that there is a correlation between adjective orders and frequency.

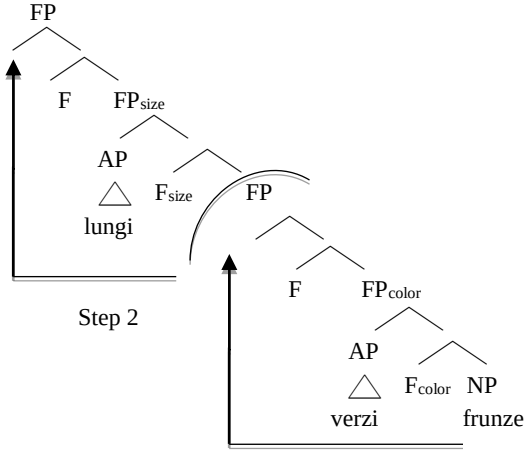
A fourth possible account of AORs could involve memory limitations (Hahn et al. 2018). According to Hahn et al. (2018), the first adjective is more likely to be lost in a noun phrase. This means that putting the objective adjective closer to the head will result in lower levels of uncertainty about the state of the world.

While researchers may disagree over the exact source of AORs in English, there is wide consensus over the rather fixed nature of a general hierarchy for adjectives in English.

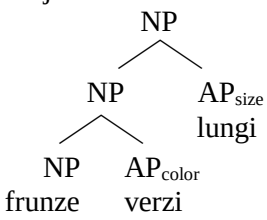
2.1. Overview of studies on adjective orders in Romanian

As far as Romanian is concerned, a Romance language where most adjectives are postnominal, there are two existing views in the literature on AORs – see (4):

(4) a. Roll-Up



b. Adjunction



According to Cinque (1994, 2005, 2010), in post-nominal adjective order, Romance languages mirror the Germanic adjective order (Cinque 2010). In order to capture the mirror effect, he proposes a Roll-Up-of-N account, deriving the mirror order by means of a set of movement operations starting from the basic English order. For instance, in (4a), the NP moves out of its position to an outer specifier (Step 1) of FP_{color}, then the newly formed FP containing FP_{color} moves out of its position to the outer specifier of the projection hosting FP_{size} (Step 2).

This view is partly supported by Rizzi et al. (2013), who investigate adjective order preferences (prenominal/postnominal) in bilingual children who either speak German and a Romance language or two Romance languages. They assume that in a bilingual child's brain, the two languages influence each other, and there may be a preference for the less complex grammatical phenomenon. Their results show that children prefer prenominal over postnominal adjectives when they produce target-deviant word orders. These findings support the idea that prenominal adjectives are derivationally less complex while the process that results in postnominal adjectives involves more steps, possibly Roll-Up.

Cinque's account (1994, 2005, 2010) is also supported by recent research by Bleotu & Roeper (2021a, b, 2022a, b) showing that adults are able to correctly interpret and produce recursive adjectives, i.e. adjectives that are merged by means of embedding/indirect recursion (Roeper 2011), and which help identify a Subset out of a Set (e.g. *flori mari mici* 'flowers big small', corresponding to *the small big flowers*). Additionally, Bleotu & Roeper (2022a, b) show that both Romanian adults and children seem to order recursive adjectives specifying different properties as a mirror image of English. In both languages, speakers tend to observe a Recursive Set Subset Ordering Constraint, i.e. they tend to place the adjective specifying a Set closer to the noun than the adjective specifying a Subset (see Bleotu et al. 2023). They would, for instance, use (5) to describe the circled leaves in Figure 1, and (6) to describe the circled leaves in Figure 2.

(5) frunze verzi lungi
leaves green l ong
'long green leaves'

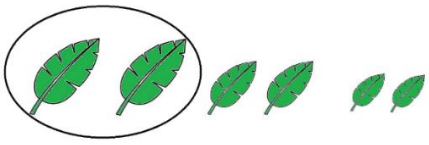


Figure 1. Example item for recursive adjectives in harmony with AOR

(6) frunze lungi verzi
leaves long green
'green long leaves'

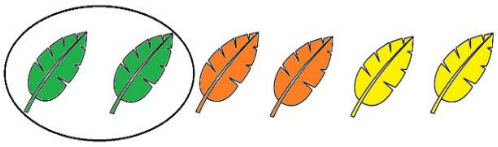


Figure 2. Example item for recursive adjectives in conflict with AOR

The Recursive Set Subset Ordering Constraint override AORs. Moreover, it also holds for recursive adjectives specifying the same dimension: size (Bleotu & Roeper 2021a, b). Here, however, Romanian adults differ from children: while almost all Romanian adults

consistently interpret (7b), a mirror order of English (7a), as referring to a subset of small flowers among a set of big flowers (flowers 3 and 4 in Figure 3), Romanian children tend to struggle with this interpretation more, often defaulting to coordination ('big and small flowers') or a simpler interpretation, deleting an adjective.

(7) a. small big flowers

b. flori(le) mari mici
flowers(-the) big small
'(the) small big flowers'

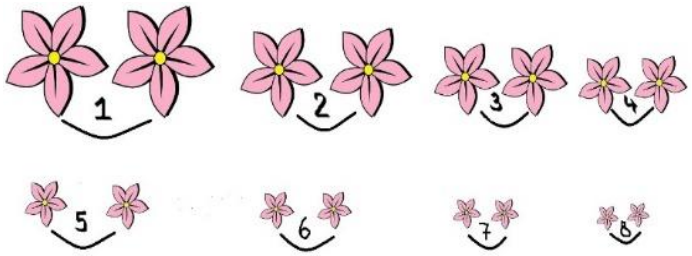


Figure 3. Example item for recursive adjectives specifying the Size dimension

Interestingly, English children seem to be able to handle such adjectives (Foucault et al. 2022). Bleotu & Roeper (2021a, b) have argued that Romanian children's difficulty with recursive adjectives specifying the Size dimension may have to do with the complexity of the syntactic operations involved in Roll-Up. Based on recursive uses of adjectives, i.e., uses which help identify a Subset out of Set, Bleotu & Roeper (2021a, b, 2022a, b) argued in favour of the cartographic approach. It is important to note that their account does not necessarily extend to coordinative uses of adjectives, i.e. uses which do not necessarily identify a Subset out of a Set.

In contrast to the cartographic approach, according to Cornilescu & Cosma (2019), adjectives are ordered more freely in Romanian than in English. Note, however, that in making this claim the authors often focus on non-recursive/possibly coordinative uses of adjectives. On the basis of a corpus study, the authors conclude that, in postnominal order, taxonomic adjectives tend to stay closer to the head than qualifying adjectives (which do not have a taxonomic reading) but, apart from this general tendency, adjectives are rather free in their ordering. The authors' findings are more in line with Scontras et al. (2017) than with Cinque (2010). Importantly, an adjunction account would seem better able to explain the data in Romanian.

A similar claim has recently been made by Pérez-Leroux et al. (2020): there is variability in AORs, but not for all adjective types. Pérez-Leroux et al. (2020) investigated Spanish adjectives and concluded that certain adjectives seem to observe a fixed order: color seems to precede other physical properties, and there is a tendency for value adjectives to occur closer to the periphery than the ones related to physical properties. This latter finding would be consistent with the theory that more subjective adjectives are closer to the noun than the more objective ones. It would also be

compatible with Dyer et al. (2020)'s information gain theory, arguing that modifiers/ adjectives which maximize information gain tend to be placed first in a variety of languages (AAN, NAA, ANA) – see also Smirnova et al. (2019) for similar findings for binomials.

An even more radical idea of a completely variable adjective ordering has been proposed for other languages (for instance, Greek, Hebrew). Leivada & Westergaard (2019), for instance, showed experimentally that speakers of Standard Greek and bidialectal speakers of Standard Greek and Cypriot Greek judged both hierarchy-non-compliant orders and hierarchy-compliant-orders as correct, as well as processed non-compliant orders similarly to hierarchy-compliant orders. They conclude that there is no universal hierarchy for adjective ordering imposing a hard constraint which results into a rigid, unmarked order. Trainin & Sheetreet (2020) investigated AORs in Hebrew in comparison to English by means of three different tasks (production, naturalness rating, and forced choice). They found that, while English speakers showed a strong preference for fixed AORs, Hebrew speakers seemed to be more variable in their preferences. Importantly, for multiple adjective strings, the orders in Hebrew did not represent a mirror image of English.

Thus, various accounts make different predictions about AORs in Romanian and other Romance languages: the cartographic account predicts that Romanian speakers should be more rigid in their ordering, showing a mirror of the English order, while the previous literature on AORs in Romanian and other languages suggests that Romanian adult speakers may be more flexible in their ordering of adjectives.

3. Current experiments

We experimentally investigated English and Romanian AORs for the following categories of adjectives: Size, Age, Shape, and Color in order to determine whether or not, as suggested by Cinque (1994, 2005, 2010) and Scontras et al. (2017, 2019), these adjectives observe a similarly fixed order in the two languages: Size > Age > Shape > Color Noun (for English), and the mirror image Noun Color > Shape > Age > Size (for Romanian).

3.1. Experiment in British English

3.1.1. Predictions

Based on previous claims and findings from the literature, we expected British speakers to order adjectives in accordance with the AOR Size > Age > Shape > Color Noun.

3.1.2. Participants

The experiment involved 32 native speakers of British English (Age range: 18–22). They answered voluntarily and were contacted online through Facebook groups.

3.1.3. Methodology and materials

We employed a forced choice task where participants were asked to choose one single option, the one which sounds more natural to them, out of two options given. The task had 76 items: 24 critical items and 52 fillers.

The critical items involved pairs of sentences containing indefinite nouns modified by two adjectives belonging to two of several categories (Size, Age, Shape, and Color): in one sentence, the order of the two adjectives matched the established AOR, whereas in another sentence, it did not. There were 4 Size Color vs. Color Size pairs (see 8), 4 Age Color vs. Color Age pairs (see 9), 4 Size Shape vs. Shape Size pairs (see 10), 4 Shape Color vs. Color-Shape pairs (see 11), 4 Age-Size vs. Size-Age pairs (see 12), and 4 Age-Shape vs. Shape-Age pairs (see 13). Out of these, the orders Size-Color, Age-Color, Size-Shape, Shape-Color, Size-Age, and Age-Shape observe the General Adjectival Hierarchy, while the orders Color-Size, Color-Age, Shape-Size, Color-Shape, and Age-Size do not.

(8) a. SizeAdj ColorAdj Noun
I have a tiny red house.
b. ColorAdj SizeAdj Noun
I have a red tiny house.

(9) a. AgeAdj ColorAdj Noun
I have an old blue book.
b. ColorAdj AgeAdj Noun
I have a blue old book.

(10) a. SizeAdj ShapeAdj Noun
He has a small round pillow.
b. ShapeAdj SizeAdj Noun
He has a round small pillow.

(11) a. ShapeAdj ColorAdj Noun
I want a triangular brown bag.
b. ColorAdj ShapeAdj Noun
I want a brown triangular bag.

(12) a. SizeAdj AgeAdj Noun
Mary has a big old bed.
b. AgeAdj SizeAdj Noun
Mary has an old big bed.

(13) a. AgeAdj ShapeAdj Noun
He is carrying a timeworn rectangular backpack.
b. ShapeAdj AgeAdj Noun
He is carrying a rectangular timeworn backpack.

We employed one attention check question and 3 types of fillers: (i) 12 (lack of) agreement fillers, where participants were exposed to a singular variant and a plural variant, only one of which was grammatical (see 14); (ii) 15 semantic fillers, where participants were exposed to an atypical adjective-noun combination and a typical adjective-noun combination, one of which was to be preferred on semantic grounds (15);

(iii) 24 ambiguous agreement fillers, where participants saw two variants, both available in the language: one where the verb agreed with a collective noun, and one where the verb agreed with the head noun (see 16).

(14) a. The children are in a good mood.
b. The children is in a good mood.
(15) a. The violent doll belongs to the girl.
b. The blonde doll belongs to the girl.
(16) a. The majority of people have a job.
b. The majority of people has a job.

Since it is not clear whether AORs are grammatical, semantic or pragmatic in nature, we opted to expose participants to fillers which exemplify violations of various types: syntactic – as in (14), semantic – as in (15), as well as fillers which simply exemplify two different preferences, but which do not represent a violation – see 16. This was done in order to prevent the set of fillers from biasing participants.

3.1.4. Results

At the group level, participants' answers were mostly in line with the AOR Size > Age > Shape > Color Noun. The clearest hierarchy-compliant answers were obtained for the orders Size > Color Noun, Size > Shape Noun, and Size > Age Noun (see the raw scores in Table 1). There were 127 answers out of 128 indicating a preference for the Size > Color Noun order as the more natural one, 121 answers out of 128 indicating a preference for the Size > Shape Noun order, and 121 answers out of 128 indicating a preference for the Size > Shape Noun order.

Participants' answers were a little less compliant with the General AOR for the orders Age > Color Noun and Age > Shape Noun (see Table 1). There were 80 answers out of 128 indicating a preference for the Age > Color Noun order as the more natural one, and 78 answers out of 128 indicating a preference for the Age > Shape Noun order.

For Shape Color Noun vs. Color Shape Noun sequences, participants preferred the order Color > Shape Noun over the expected Shape > Color Noun (see Table 1).

Table 1. Number and proportion of expected answers in British English

Adjectival categories	Counts	Expected answers
Age-Color vs. Color-Age	80/128	62.5%
Age-Shape vs. Shape-Age	78/128	60.93%
Shape-Color vs. Color-Shape	57/128	44.53%
Size-Age vs. Age-Size	121/128	94.53%
Size-Shape vs. Shape-Size	121/128	94.53
Size-Color vs. Color-Size	127/128	99.21%
Overall score	584/768	76.06%

We also looked at the data individually (per participant). For each adjectival category combination (Age-Color, Age-Shape, Shape-Color, Size-Age, Size-Color, Size-Shape), 4 items were tested. Consequently, the highest score a participant could obtain for each combination of adjectives was 4. We classified participants into three types: (i) (hierarchy)-compliant, if their score for a category combination was equal to or higher than 3 out of 4, i.e., they gave 3 or 4 answers in line with the expected General AOR, (ii) mixed, if their score was equal to 2 out of 4 (, i.e. 50%), and (iii) non-compliant, if their score was lower than 2 out of 4 (0 or 1). In line with the previous group results, we found that participants seemed to observe the General AOR the most for the combinations Size-Color, Size-Age and Size-Shape, and the least for Shape-Color (see Table 2 for specific numbers, and Figure 4 for a visual representation of proportions of participant types).

Table 2. Counts of participant types per adjectival category combinations in British English

Adjectival categories	Participant types		
	Compliant	Mixed	Non-compliant
Age-Color	16	10	6
Age-Shape	14	12	6
Shape-Color	7	14	11
Size-Age	31	0	1
Size-Color	32	0	0
Size-Shape	31	1	0

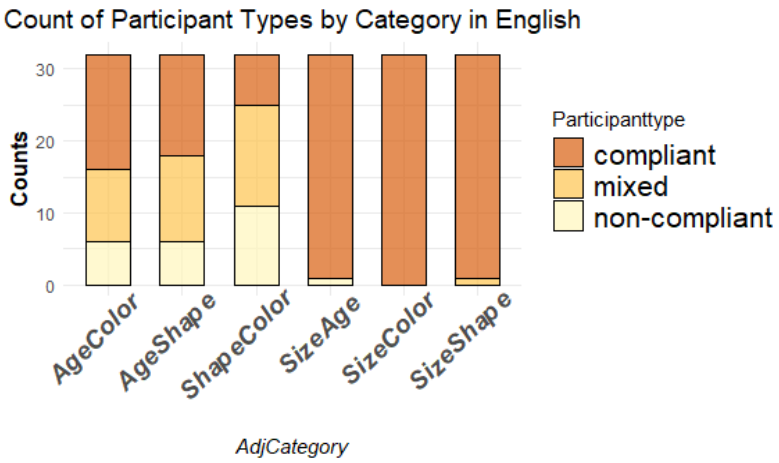


Figure 4. Proportion of participant types by adjectival category in British English

Overall, looking at a participant's mean score over all category combinations, 31 participants out of 32 gave answers in accordance with the general AOR at a rate higher than 50%, and 18 participants of these did so at a rate higher than 75%.

3.2. Experiment in Romanian

3.2.1. Predictions

If Cinque (1994, 2005, 2010) is correct in his claim that Romanian orders adjectives as a mirror of English, then Romanian native speakers should order adjectives according to the mirror hierarchy: Noun Color > Shape> Age > Size. If, on the other hand, Romanian does not employ a hierarchical ordering of adjective categories, as suggested by Cornilescu & Cosma (2019), then participants should allow more flexible orders of adjectives.

3.2.2. Participants

The experiment involved 27 native speakers of Romanian (Age range: 18–22). They answered voluntarily and were contacted online.

3.2.3. Methodology and materials

The design was identical to Experiment 1. The materials for English were translated into Romanian:

(17) a. Noun ColorAdj SizeAdj
Eu am o casă roşie mica.
I have a house red tiny
'I have a tiny red house.'

b. Noun SizeAdj Color Adj
Eu am o casă mica roşie.
I have a house tiny red
'I have a red tiny house.'

(18) a. Noun ColorAdj AgeAdj
Eu am o carte albastră veche.
I have a book blue old
'I have an old blue book.'

b. Noun AgeAdj ColorAdj
Eu am o carte veche albastră.
I have a book old blue
'I have a blue old book.'

(19) a. Noun ShapeAdj SizeAdj
El are o pernă rotunda mică.
he has a pillow round small
'He has a small round pillow.'

b. Noun SizeAdj ShapeAdj
El are o pernă mică rotundă.
he has a pillow small round
'He has a round small pillow.'

(20) a. Noun ColorAdj ShapeAdj
Eu vreau o geantă maro triunghiulară.
I want a bag brown triangular
'I want a triangular brown bag.'

b. Noun ShapeAdj ColorAdj
Eu vreau o geantă triunghiulară maro.
I want a bag triangular brown
'I want a brown triangular bag.'

(21) a. Noun AgeAdj SizeAdj
Maria are un pat vechi mare.
Maria has a bed old big
'Maria has a big old bed.'

b. Noun SizeAdj AgeAdj
Maria are un pat mare vechi
Maria has a bed big old
'Maria has an old big bed.'

(22) a. Noun ShapeAdj AgeAdj
El cară un ghiozdan dreptunghiular învechit.
he carries a backpack rectangular timeworn
'He is carrying a timeworn rectangular backpack.'

b. Noun AgeAdj ShapeAdj
El cară un ghiozdan învechit dreptunghiular.
he carries a backpack timeworn rectangular
'He is carrying a rectangular timeworn backpack.'

3.2.4. Results

For the most part, Romanian speakers' answers were not in line with the mirror AOR Noun Color > Shape > Age > Size (see Table 3). However, participants did give expected answers more than 50% of the time for combinations of Age and Size adjectives and for combinations of Shape and Color adjectives. Nevertheless, these rates were still lower than 75%. For the other adjectival category combinations, the rates of expected answers range between 40–60%. In contrast, in English, the rates are generally higher.

Table 3. Number and proportion of expected answers in Romanian

Adjectival categories	Counts	Expected answers
Age-Color vs. Color-Age	65/120	54.16%
Age-Shape vs. Shape-Age	61/120	50.83%
Shape-Color vs. Color-Shape	76/120	63.33%
Size-Age vs. Age-Size	84/120	70.00%
Size-Shape vs. Shape-Size	54/120	45.00%
Size-Color vs. Color-Size	50/120	41.66%
Overall score	390/720	54.16%

We also looked at the data individually (per participant). We adopted the same classification of participants detailed in 3.1.4: compliant, mixed, and non-compliant participants. As one can see in Table 4 and Figure 5, in Romanian, the number of non-compliant and mixed participants exceeds the number of compliant participants for each adjectival category combination, except for Shape Color. For a clearer comparison with the previous results from British English, the proportion of answers compliant with the General Adjectival Hierarchy have been plotted in the same graph for both British English and Romanian (see Figure 6). The answers in the Romanian experiment reveal more variation in the answers than in the British English experiment.

Overall, looking at individual participants' mean scores over all category combinations, we find that 15 participants out of 27 gave answers in accordance with the general AOR at a rate between 50% and 75%, while 12 consistently gave non-compliant answers at a rate higher than 50%. This provides a clear contrast with the data from British English speakers, where every participant gave compliant answers at a rate equal to or higher than 50% of the time.

Table 4. Counts of participant types per adjectival category combinations in Romanian

Adjectival categories	Participant types		
	Compliant	Mixed	Non-compliant
Age-Color	7	9	11
Age-Shape	9	11	7
Shape-Color	14	9	4
Size-Age	11	10	6
Size-Color	6	9	12
Size-Shape	7	10	10

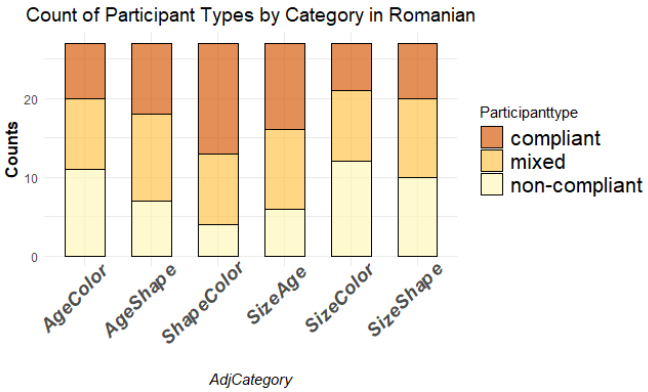


Figure 5. Proportion of participant types by adjectival category in British English

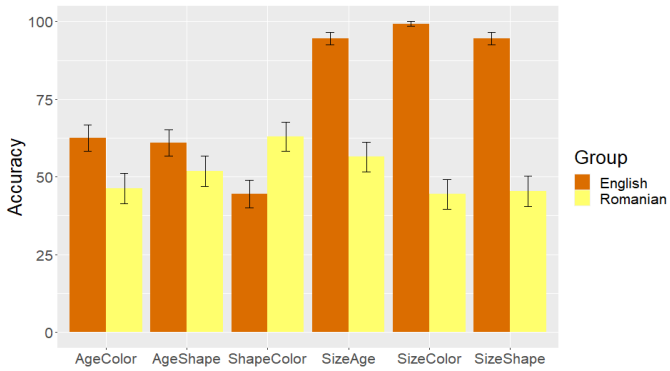


Figure 6. Proportion of answers compliant with the General Adjectival Hierarchy per adjectival category in British English and Romanian

3.2.5 Statistical analysis

We analyzed the results using logit mixed−effects models in R-4.0.5 (2021). We computed a mixed effects model with Answer (coded as 1 if expected, i.e. hierarchy-compliant, and 0 if unexpected, i.e. hierarchy-non-compliant) as a dependent variable (DV), Adjectival category (Age-Color, Age-Shape, Shape-Color, Size-Age, Size-Color, Size-Shape), Language Group (British English, Romanian), and their interaction as fixed effects, and with random slopes per Item and Participant. We found a significant effect for Group (ß = −0.743, SE = 0.303, Z = −2.448, $p < .05$), for the combination Size Age (ß = 2.769, SE = 0.641, Z = 4.320, $p < .01$), Size Color (ß = 4.456, SE = 1.115, Z = 3.996, $p < .01$), Size Shape (ß = 2.491, SE = 0.622, Z = 4.005, $p < .01$), as well as for the interaction between Group and the Size Age combination (ß = −2.281, SE = 0.553, Z = −4.121, $p < .01$), the interaction between Group and the Size Color combination (ß = −4.534, SE = 1.0666, Z = −4.251, $p < .01$), the interaction between Group and the Size Shape combination (ß = −2.532, SE = 0.531, Z = −4.769, $p < .01$), and the interaction between Group and the Shape Color combination (ß = 1.563, SE = 0.397, Z = 3.929, $p < .01$). Overall, our statistical analysis supports the idea of a more flexible, variable ordering of adjectives in Romanian compared to British English, except for the Shape Color combination, where, surprisingly, Romanian speakers seem to be more hierarchy-compliant than British English speakers. In particular, for the combinations Size Age, Size Color and Size Shape, British English speakers are significantly more hierarchy-compliant than Romanian speakers.

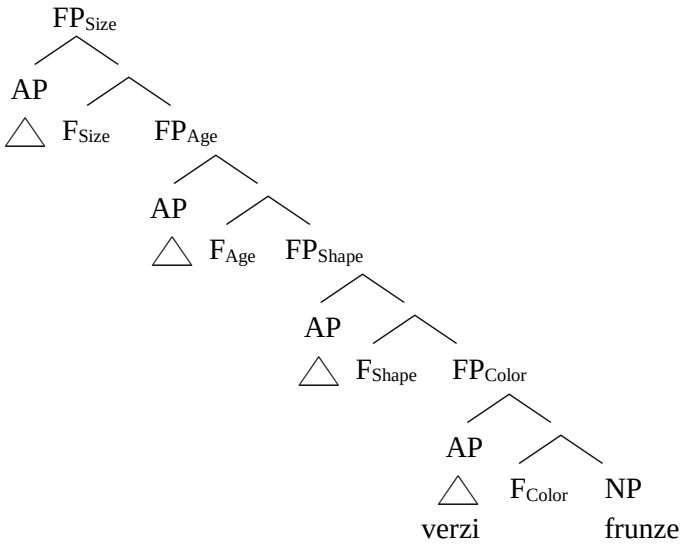
4. Discussion

Our experimental findings suggest that English and Romanian differ in how they order adjectives. English seems to be rule-based in its ordering of adjectives, while in Romanian the ordering is much more variable.

The results from British English are indicative of a hierarchy among adjectival categories, given that participants mostly gave answers in line with the expected order Size > Age > Shape > Color (Dixon 1982, Scott, 2002, Cinque 1994, 2005, 2010, a.o.). Nevertheless, while cartography predicts a fixed order among adjective categories, we found that participants ordered Size > Age, Size > Color, and Size > Shape in compliance with the general AOR to a larger extent than they ordered Age > Color, Age > Shape, and Shape > Color.

These findings could be accounted for by assuming that the adjectives specifying the properties Size, Age, Shape, and Color are syntactically ordered in a cartographic fashion (23), but other factors may have interfered with the participants' answers when these did not observe general hierarchy: length, for instance, or information structure/meaning. Some Shape adjectives (like *triangular* or *rectangular*) tend to be rather long/heavy, which may explain why British English speakers tend to place them at the end of the adjectival sequence (*I want a brown triangular bag*). Some Age adjectives (like *new* or *old*) may be taken to encode additional information about an object, helping to define its kind. If this is the case, then this would explain why British speakers may sometimes place them closer to the noun than expected. The Shape-Color variability may be explained by the closeness of the two categories in the hierarchy, which may lead to less certainty in participants' orders.

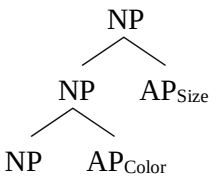
(23)



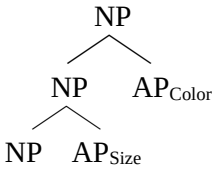
While the results from British English indicate the existence of a hierarchy (with some exceptions), the results from Romanian suggest instead that participants are quite variable in their ordering of adjectives specifying different dimensions. The highest score for expected answers (70%) is much lower than the highest score for expected answers in the English group (99.21%). Interestingly, some speakers seem to observe general AORs more than others, but, despite this, there is still a lot of variability. The percentages in Romanian revolve around the 50% mark, indicating that multiple orders are acceptable:

for instance, Noun > Color > Size, as well as Noun > Size > Color (see 24). These results seem to suggest that there are no strong preferences in Romanian, similarly to Greek (Leivada & Westegaard 2019), where no order was judged as correct or preferable. Furthermore, they are in line with Cornilescu & Cosma (2019)'s corpus analysis, indicating a freer order of adjectives in production.

(24) a.



b.



Overall, our findings undermine the idea of a universal crosslinguistic hierarchy of adjectives. On the one hand, since the ordering of adjectives is more flexible in Romanian and does not represent a mirror order of English, it is more likely that adjectives in Romanian are merged by adjoining rather than Roll-Up. A cartographic order would be too rigid to explain the variance found in the data. On the other hand, our findings represent a challenge for Scontras's theory that subjectivity is important in predicting adjective ordering. Scontras et al. (2017, 2019) argue that, by placing objective adjectives closer to the head, we are more likely to avoid disagreement and transmit useful information. However, if that were the case, adjective order would be universal since these needs are universal. This conclusion is not supported by our data: adjective ordering preferences seem to exist in English, but not in Romanian. A pending question remains: why do some languages have adjective ordering preferences and others do not? A possible answer to this may be related to the existence of an adjective ordering parameter which gets valued differently in different languages: in some languages (like English), adjectives observe a (rather) fixed hierarchy, while in others (like Romanian), they do not, and they occur rather freely. This matter remains to be explored further by means of corpus and experimental methods applied to a variety of languages.

5. Conclusions

To conclude, the paper has provided experimental evidence for a contrast between British English speakers and Romanian speakers in terms of how they order Size, Age, Shape and Color adjectives: while British speakers seem to observe the hierarchy N > Size > Age > Shape > Color overall, Romanian speakers are more variable in their ordering preferences. This casts doubt on the idea of a fixed universal hierarchy of adjectives, as well as on the explanatory power of subjectivity.

Data availability

The data and code associated with the paper are available at https://osf.io/fq5ty.

Ethics and consent

The study has been conducted under approval of the Research Ethics Committee of the University of Bucharest (19/17.02.2022), and consent has been obtained from all participants.

Acknowledgments

We would like to thank the native speakers of British English and the undergraduate students at the Faculty of Foreign Languages and Literatures, University of Bucharest, for taking part in the experiments. In addition, we would like to express our gratitude to Tom Roeper and Deborah Foucault for their helpful suggestions.

References

Abels, K. & Neeleman, A. 2010. Linear asymmetries and the LCA. *Syntax* 12 (1): 25-74.

Bleotu, A. C., Foucault, D. & Roeper, T. 2023. The Recursive Set-Subset Ordering Principle orders adjectives and relative clauses in visual context. *Proceedings of the Linguistic Society of America* 8 (1): 5535.

Bleotu, A. C. & Roeper, T. 2021a. *Small big flowers* or *small and big flowers*? Simple is better and Roll-Up is too complex for Romanian 5-year-olds. In D. Dionne & L. A. Vidal Covas, *Proceedings of the 45th annual Boston University Conference on Language Development*, vol. 1, 66-79. Somerville, MA: Cascadilla Press.

Bleotu, A. C. & Roeper, T. 2021b. Roll-Up is too complex for Romanian 5-year-olds. Evidence from recursive adjectives. In *Proceedings of the Linguistic Society of America* 6 (1): 133-143.

Bleotu, A. C. & Roeper, T. 2022a. The Recursive Set-Subset Ordering Restriction overrides Adjective Ordering Restrictions. Evidence from Romanian 4-year-olds and adults. In Y. Gong F. Kpogo (eds), *Proceedings of the 46th Annual Boston University Conference on Language Development*, vol. 1, 62-75. Somerville, MA: Cascadilla Press.

Bleotu, A. C. & Roeper, T. 2022b. Children are more sensitive to the Recursive Set-Subset Ordering than to adjective ordering restrictions. In *Proceedings of the Linguistic Society of America* 7 (1): 5267.

Champollion, L. 2006. A game-theoretic account of adjective ordering restrictions. https://www.lingv.upenn.edu/~champoll/adjective-ordering.pdf.

Cinque, G. 1994. On the evidence for partial N-movement in the Romance DP. In G. Cinque, J. Koster, J.-Y. Pollock, L. Rizzi & R. Zanuttini (eds.), *Paths Towards Universal Grammar. Studies in Honor of Richard S. Kayne*, 85-110. Washington DC: Georgetown University Press.

Cinque, G. 2005. Deriving Greenberg's Universal 20 and its exceptions. *Linguistic Inquiry* 36 (3): 315-332.

Cinque, G. 2010. *The Syntax of Adjectives. A Comparative Study*. Cambridge, MA: MIT Press.

Cornilescu, A. & Cosma, R. 2019. Linearization of attributive adjectives in Romanian. *Revue roumaine de linguistique*, LXIV (3): 307-323.

Cornilescu, A. & Giurgea, I. 2013. The Adjective. In C. Dobrovie-Sorin & I. Giurgea (eds.), *A Reference Grammar of Romanian*, vol. 1, 355-530. Amsterdam/Philadelphia: John Benjamins.

Cornilescu, A. & Nicolae, A. 2016. Romanian adjectives at the syntax–semantics interface. *Acta Linguistica Hungarica* 63 (2): 197-240.

Dixon, R. M. W. 1982. '*Where Have All the Adjectives Gone?' and other Essays in Semantics and Syntax*. Berlin: Mouton de Gruyter.

Dyer, W., Futrell, R., Liu, Z., & Scontras, G. 2020. Predicting cross-linguistic adjective order with information gain. arXiv.org. https://arxiv.org/abs/2012.15263.

Foucault, D., Bleotu, A. C., Lakshmanan, U., Merritt, E., Sybing, R. & Roeper, T. 2022. Relative gradable adjective recursion is more challenging for acquisition than possessive recursion. In *Proceedings of the Linguistic Society of America* 7 (1): 5294.

Franke, M., Scontras, G. & Simonic, M. 2019. Subjectivity-based adjective ordering maximizes communicative success. *Proceedings of the 41st Annual Meeting of the Cognitive Science Society (CogSci 2019). Creativity + Cognition + Computation*, 344-350.

Grohe, L. & Schulz, P. 2022. *Big round clocks* and *blue square tables*: Adjective ordering preferences in elicited child and adult Production. In Y. Gong & F. Kpogo (eds.), *Proceedings of the 46th Annual Boston University Conference on Language Development*, vol. 1, 242-255. Somerville, MA: Cascadilla Press.

Hahn, M., Degen, J., Goodman, N., Jurafsky, D. & Futrell, R. 2018. An information-theoretic explanation of adjective ordering preferences. In *Proceedings of the Fortieth Annual Conference of the Cognitive Science Society. Changing/Minds*, 1776-1771.

Hetzron, R. 1978. On the relative order of adjectives. In H. Seller (ed.), *Language Universals*, 165-184. Tübingen: Narr.

Kotowski, S. & Härtl, H. 2019. How real are adjective order constraints? Multiple pronominal adjectives at the grammatical interfaces. *Linguistics* 57 (2): 395-427.

Kremers, J. M. 2003. *The Arabic Noun Phrase: A Minimalist Perspective*. PhD dissertation, Radboud University, Nijmegen.

Leivada, E. & Westergaard, M. 2019. Universal linguistic hierarchies are not innately wired. Evidence from multiple adjectives. *PeerJ* 7: e7438.

Pérez-Leroux A., Tough, A., Pettibone, E. & Chen, C. 2020. Restrictions on ordering of adjectives in Spanish. *Borealis–An International Journal of Hispanic Linguistics* 9 (1): 181-208.

Rizzi, S., Arnaus Gil, L., Repetto, V., Geveler, J. & Müller, N. 2013. Adjective placement in bilingual Romance-German and Romance-Romance. *Studia Linguistica* 67 (1): 123-147.

Roeper, T. 2011. The acquisition of recursion: How formalism articulates the child's path. *Biolinguistics* 5 (1-2): 57-86.

Scontras, G., Degen, J. & Goodman, N. D. 2017. Subjectivity predicts adjective ordering preferences. *Open Mind* 1 (1): 53-65.

Scontras, G., Degen, J. & Goodman, N. D. 2019. On the grammatical source of adjective ordering preferences. *Semantics and Pragmatics* 12 (7): 1-21.

Scott, G.-J. 2002. Stacked adjectival modification and the structure of nominal phrases. In G. Cinque (ed.), *Functional Structure in the DP and IP*, vol. 1, *The Cartography of Syntactic Structures*, 91-120. Oxford and New York, NY: Oxford University Press.

Smirnova, A., Sanchez, R. R., & Lenarsky, A. 2019. Contextual Determinants of Adjective Order: Beyond Itsy Bitsy Teeny Weeny Yellow Polka Dot Bikini. *Proceedings of the 41st Annual Meeting of the Cognitive Science Society (CogSci 2019). Creativity + Cognition + Computation*, 2825-2831.

Sproat R. & Shih, C. 1991. The cross-linguistic distribution of adjective ordering restrictions. In C. Georgopoulos & R. Ishihara (eds.), *Interdisciplinary Approaches to Language*, 565-593. Dordrecht: Kluwer.

Teodorescu, A. 2006. Adjectives ordering restrictions revised. In D. Baumer, D. Montero, D. & M. Scanlon (eds.), *Proceedings of the 25th West Coast Conference on Formal Linguistics*, 399-407. Somerville, MA: Cascadilla Proceedings Project.

Trainin, N. & Shetreet, E. 2021. *It's a dotted blue big star*: On adjective ordering in a post-nominal language. *Language, Cognition and Neuroscience* 36 (3): 320-341.