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The colour lexicon of the Serbian language – a study of dark blue and dark red colour categories Part 1: Colour-term elicitation task

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In this study, we linguistically investigated Serbian colour terminology. We administrated colour-term elicitation task aiming to establish the inventory of basic colour terms (BCTs) in the Serbian language and, in particular, to investigate the salience and the status of colour terms *teget* 'dark blue' and *bordo* 'dark red'. Native speakers of Serbian ($N = 83$) participated in a list task (Morgan & Corbett, 1989), in which they had to list as many Serbian colour terms as possible during five minutes. Based on the collected data, we calculated frequency of each term, its mean position and two indexes of salience. Results showed that 11 Serbian most salient colour terms correspond to the eleven BCTs found by Berlin and Kay (1969), namely, *plavo* 'blue', *crveno* 'red', *žuto* 'yellow', *zeleno* 'green', *crno* 'black', *belo* 'white', *ljubičasto* 'purple', *narandžasto* 'orange', *sivo* 'grey', *roze* 'pink', and *braon* 'brown', but that basic status of *braon* needs to be further examined. *Teget* 'dark blue' and *bordo* 'dark red', along with *tirkizno* 'turquoise' and *oker* 'ochre' were frequently used, with higher salience indices than other non-BCTs. Further research is needed to find out whether *teget* and *bordo* meet criteria of BCTs in the Serbian language.

Key words: colour terms, Serbian language, colour-term elicitation task

Highlights:

- We studied Serbian colour terminology using colour-term elicitation task.
- The most salient Serbian colour terms were found to correspond to the 11 BCTs identified by Berlin and Kay (1969), with basic status of *braon* 'bown' remaining equivocal.
- Four highly salient non-BCTs have been identified: *teget* 'dark blue', *bordo* 'dark red', *tirkizno* 'turquoise' and *oker* 'ochre'.

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Colour is a perceptual property, determined by subjective attributes – hue, lightness and saturation. Three-dimensional (3D) colour space is lexicalised by a limited number of colour categories labelled (in adults) by colour terms. The evolution and universality of linguistic colour categories have been the focus of numerous studies over the last decades and have been discussed predominantly from two viewpoints. According to the original *universalistic* view, (1) colour categorisation is related to physiology of the visual system; (2) colour categories emerge in an (almost) universal order, and (3) such universal colour categories show locations of foci ('best exemplars') and boundaries similar in different languages. The universalistic hypothesis was put forward by Berlin and Kay (1969/1991), who identified basic colour terms (BCTs), as the minimal set that could describe the whole colour space. Berlin and Kay (1969) proposed a universal set of (maximally) 11 BCTs across languages, which in the English language include *white*, *black*, *red*, *yellow*, *green*, *blue*, *brown, purple*, *orange*, *pink,* and *grey*. Later studies (Kay & MacDaniel, 1978; WCS: Kay, Berlin, Maffi, Merrifield, & Cook, 2009) revised Berlin and Kay's original theory, in particular, the universality of the order of BCTs' emergence and cognitive mechanisms underlying it. However, the assumption that similar areas of colour space are lexicalised by the BCTs in different languages has remained (Kay & Maffi, 1999).

The opposing, *relativistic* view posits that languages differ in the way they describe reality and that those differences affect the cognition of their speakers (Whorf, 1940/1956, as cited in Özgen & Davies, 2002). In the colour domain that would mean that colour categories are specific to a particular language and are differently represented on higher cognitive level among speakers of different languages (Saunders & Van Brakel, 1997). Several ensuing studies of remote languages provided evidence of language-specific modulation of colour categorisation (Davidoff, Davies, & Roberson, 1999; Roberson, Davies, & Davidoff, 2000; Roberson, Davidoff, Davies, & Shapiro, 2004). These findings led to developing the *weak relativity* hypothesis, which accepts universal mechanisms of colour categorisation, but also recedes to language-specific modulation with regards to category foci and boundaries.

In recent years, a widely accepted theoretical framework for explaining the universality in colour naming has been the Interpoint Distance Model (IDM) put forward by Jameson and D'Andrade (1997). According to this model, universal colour categories (in adults) reflect an optimal partition of irregularly shaped colour space, which maximizes its informativeness and ensures the optimal communication about colour. That means that language categories partition colour space to increase differences between categories and reduce differences within categories. Further, IDM proposes that due to interaction of hue, saturation, and lightness certain regions of colour space are more perceptually salient than others (e.g., focal yellow, focal red), which makes them more informative and, thus, likely to be named in different languages (Jameson &

D'Andrade, 1997). Therefore, according to IDM, universality in colour naming is more closely linked to the need to encode colour space informatively than to colour vision mechanisms (Jameson & Alvarado, 2003).

IDM was formalized by Regier, Kay, and Khetarpal (2007) who tested it on the colour-naming data collected from 110 languages in the WCS study (Kay et al., 2009). This formalization confirmed the main assumption of IDM, demonstrating that universal tendencies to optimally partition the colour space set constrains regarding the position and shape of colour categories across languages, but not necessarily regarding the identical places of foci. In addition, Regier and colleagues noted that specific linguistic conventions might affect the optimality of colour-space partition, which results in cross-language variations in places of categories' boundaries (Regier et al., 2007). Therefore, this optimal partition hypothesis can be comprehended as a "middle ground" in the universalistic-relativistic debate, explaining both similarities and differences in colour naming across languages (Douven, 2017).

The IDM model also implies that colour terminology, like any other domain of language, may change over time (Jameson & D'Andrade, 1997). This is in line with a conjecture of Kay and McDaniel (1978) that finer partitions of colour space, beyond the originally proposed 11 BCTs, are possible. In accord with this conjecture are findings providing evidence that some languages actually have more than 11 BCTs. For example, speakers of Russian language make a distinction between dark blue shades called *sinij* and light blue shades called *goluboj*, the categories being "phenomenologically distinct colours" (Paramei, 2005, p. 12). The basic status of the two blue categories in Russian have been demonstrated both in studies that used linguistic measures, like frequencies in texts (Corbett & Morgan, 1988) and behavioural measures, like colour naming and colour-term elicitation tasks (Davies & Corbett, 1994; Moss, 1989). Similar partition of the BLUE colour region into two salient colour terms exists in other East Slavic languages – Ukrainian and Belarusian (Hippisley, 2001). There are also studies showing that *ghalazio* 'light blue' is the 12th BCT in modern Greek language (Androulaki et al., 2006), while *lacivert* 'dark blue" is 12th BCT in the Turkish language (Özgen & Davies, 1998). Recently, studies have discussed an expansion of English BCT inventory suggesting that terms *teal*, *peach*, *lavender,* and *maroon* (Lindsey & Brown, 2014) or terms *lilac* and *turquoise* (which are similar to *lavender* and *teal*, respectively; Mylonas & MacDonald, 2016) might be acquiring a BCT status. In sum, these studies confirm that colour vocabulary is evolving and that there might be more than firstly proposed 11 BCTs that are frequently used and cognitively salient for speakers of different languages. In this study, we investigated cognitive salience of Serbian colour terms aiming to establish the BCT inventory. Only a few studies addressed Serbian colour terms using linguistic, corpus data analyses (Lazarević, 2013; Popović, 1991), but no behavioural measures of Serbian colour terms were collected in previous research. Therefore, we decided to administrate the list task proposed by Morgan

and Corbett (1989), which has been widely used for establishing the inventory of BCTs in different languages (Davies & Corbett, 1994; Hippisley, Davies, & Corbett, 2008; Moss, 1989; Özgen & Davies, 1998; Uusküla & Sutrop, 2007).

We were particularly interested in the saliency and status of two Serbian monolexemic terms that are used to describe dark blue shades – *teget* and dark red shades – *bordo*. As demonstrated in previous studies (Hippisley, 2001; Özgen & Davies, 1998; Paramei, 2005), the BLUE area of colour space is particularly prone to segregation into two BCTs. Similarly, terms denoting dark red shades (*maroon*, *bordó*, *bordovyj*) have shown significant cognitive saliency in several languages (Hippisley, 2001; Lindsey & Brown, 2014; Uusküla, Hollman, & Sutrop, 2012). Therefore, we aimed to investigate whether the additional terms for blue and red in the Serbian language could, as well, be considered as candidates for BCTs.

In order to analyse Serbian colour terms inventory, we were guided by Berlin and Kay's (1969) criteria of BCTs. According to these criteria, in order for a term to be considered a BCT: (1) it has to be monolexemic; (2) its meaning should not be included in the meaning of any other colour term; (3) the application of the term must not be restricted to a narrow class of objects, and (4) the term must be psychologically salient for speakers, i.e., show a tendency to occur at the beginning of an elicited list of colour terms, stability of reference across speakers and occasions of usage, and occur in the idiolects of all speakers (Berlin & Kay, 1969, p. 6).

Since the Serbian language has monolexemic terms for 11 universal categories proposed by Berlin and Kay (1969), we can assume that it has (at least) 11 BCTs. These terms are: *belo* 'white', *crno* 'black', *crveno* 'red', *plavo* 'blue', *žuto* 'yellow', *zeleno* 'green', *braon* 'brown', *ljubičasto* 'purple', *narandžasto* 'orange', *sivo* 'grey' and *roze* 'pink'.

As for the term *teget*, according to the Serbian *Big dictionary of foreign words and phrases* (Klajn & Šipka, 2006), it is defined as "dark shades of blue fabric". *Teget* is a monolexemic term and denotes only dark blue colour (the word *teget* in Serbian does not have any other meaning). In spite of the dictionary explanation, usage of *teget* is not restricted to colour of fabrics, but it is used to denote dark blue tones in general (cf. Krimer-Gaborovic, 2014), including shades of artificial objects and a wide range of natural objects and substances, such as aubergine, sea or sky.

In Serbian, the term *bordo* is defined as "dark red colour" (Klajn & Šipka, 2006). The term is a loanword from French *bordeaux* and denotes the shade of dark red colour of wine produced in that region (claret/burgundy). The term *bordo* is used for denoting colour of a variety of artificial objects, but also of some natural objects (such as cherry). The term can also be found in Hungarian as *bordó* (Uusküla & Sutrop, 2007) and, as an adjective *bordovyj*, in Russian (Corbett & Morgan, 1988) and Ukrainian (Hippisley, 2001).

Both *teget* and *bordo* fulfil the moneloxemic criterion for a BCT, and their application is not restricted to a narrow class of objects (3rd criterion). However, both terms can be described as types of blue and red, respectively, and, hence, do not meet the 2nd criterion proposed by Berlin and Kay (1969). The 4th criterion relating to cognitive salience of these terms is addressed in the present study.

Method

Participants

First-year Psychology students (N = 83, 71 females) from the University of Novi Sad participated in the list task. All participants were native Serbian speakers. They have signed the informed consent and were given course credit for their participation.

Procedure

Participants were seated in front of a computer (1.4 GHz Mac mini). The instruction for the list task (Morgan & Corbett, 1989) was read to them and simultaneously presented on the computer screen. The task was to name (i.e. type using a keyboard) as many Serbian colour terms as possible and to press 'Enter' key at the end. The task was limited to 5 minutes.

Data analysis

From the collected data we calculated how frequently each colour term occurred across the lists, which provided information about terms that are actively used by Serbian speakers (Morgan & Corbett, 1989). The order of elicited colour term was also recorded. Based on this information, we calculated mean position of the term across individual lists.

These two measures were combined into the Cognitive Salience index (Sutrop, 2001), which is independent of the lists' length and allows comparison of our results to those in similar studies of other languages. The Cognitive Salience index (S) was calculated using the formula:

$$S = f / (N\ MP)$$

where f is frequency (the number of participants that listed the term), N is total number of participants and MP is mean position of the term. S varies from 1 (*maximally salient item*) to 0 (*item is not present in any list*; Sutrop, 2001).

Since this was the first behavioural study of Serbian colour terminology, we decided to additionally calculate the Free-list salience index C introduced by Smith (1993; Smith, Furbee, Maynard, Quick, & Ross, 1995). The C index is calculated using the following formula:

$$C = ((\Sigma(L - Rj+1) / L)) / N$$

where Rj is a rank of item j in the list, L is the length of a list, and N is the number of lists in the sample. The C salience index also ranges from 1 to 0, where higher index represents the higher salience. The Smith's C index is dependent on the length of individual lists, hence, does not allow direct comparison with other studies that applied S index. However, when used as an additional measure, it was considered an auxiliary measure for an insight into salience of colour terms.

In addition, we calculated Zipf-function of Serbian colour term frequency that reflects colour-term popularity, namely $\log_{10}$ values of the number of participants who have listed the term vs. $\log_{10}$ values of the term's rank order as suggested by Lindsey and Brown (2014) and Brown, Isse, and Lindsey (2016). Following the work of these authors, we were looking for a double-power law behaviour, which should reflect the difference between the words used for general but imprecise communication and words that enable a more specific exchange of information (Ferrer i Cancho & Solé, 2001, as cited in Lindsey & Brown, 2014) and, therefore, reflect the difference between BCTs and nonBCTs in the Serbian language.

Results

In total participants produced 1391 items listing 69 different colours. The shortest colour list contained 11 terms, while the longest list contained 36 items. On average, participants produced 16.75 colour terms.

Table 1 includes only those colour terms (N = 29) that were recalled by more than three participants as suggested in Sutrop (2001), since if a sample consists of more than 50 participants, one can consider that terms mentioned by three or fewer participants are either in passive use or used only in some idiolects (Sutrop, 2001). Table 1 presents colour term frequency, f (number of participants that listed the term), mean position of the term, MP, Cognitive salience index, S, and Smiths' C salience index, C. Table 1 shows ranks for all measures of salience (R_F, R_{MP}, R_S, R_C) but the terms are ranked by the salience indexes R_S and R_C (which are identical).

Table 1
Outcome of the elicitation task for Serbian colour terms (N = 29) ordered from the highest to the lowest Cognitive salience index S.

Serbian colour term	English gloss	f	f(%)	R_f	MP	R_{MP}	S	R_S	C	R_C
Plavo	Blue	83	100	1.5	3.76	2	.27	1	.84	1
Crveno	Red	81	97.6	4.5	3.72	1	.26	2	.80	2
Žuto	Yellow	82	98.8	3	5.32	3	.18	3	.73	3
Zeleno	Green	83	100	1.5	5.44	4	.18	4	.73	4
Crno	Black	79	95.2	7	6.26	6	.15	5	.65	5
Belo	White	77	92.8	9	6.21	5	.15	6	.63	6
Ljubičasto	Purple	81	97.6	4.5	7.91	7	.12	7	.55	7
Narandžasto	Orange	79	95.2	7	8.10	8	.12	8	.55	8
Sivo	Grey	79	95.2	7	8.51	9	.11	9	.51	9
Roze	Pink	71	85.5	10	9.15	10	.09	10	.43	10
Braon	Brown	66	79.5	11	11.24	12	.07	11	.31	11
Tirkizno	Turquoise	54	65.1	13	10.63	11	.06	12	.29	12
Bordo	Claret/Burgundy	56	67.5	12	11.64	14	.06	13	.26	13
Oker	Ochre	48	57.8	14	11.46	13	.05	14	.22	14
Teget	Dark blue	43	51.8	15	13.30	19	.04	15	.14	15
Bež	Beige	30	36.1	17	12.03	15	.03	16	.12	16.5
Ciklama	Cyclamen pink	25	30.1	18	12.32	17	.02	17	.12	16.5
Krem	Cream-coloured	31	37.3	16	15.87	27	.02	18	.10	18
Maslinasta	Olive	24	28.9	19	14.37	23	.02	19	.09	19
Zlatna	Gold	23	28.4	20	14.30	22	.02	20	.08	20
Lila	Lilac	20	24.1	22	12.75	18	.02	21	.08	21
Pink	Hot pink	20	24.1	22	13.70	21	.02	22	.07	22
Srebrna	Silver	20	24.1	22	16.40	28	.01	23	.06	23
Smeđa	Brown (denoting hair colour)	13	15.6	24	15.54	26	.01	24	.05	24
Purpurna	Magenta	9	10.8	25.5	12.11	16	.01	25	.04	25
Ružičasta	Reddish pink	9	10.8	25.5	13.33	20	.01	26	.04	26
Indigo	Indigo	7	8.4	27.5	14.57	24	.01	27	.03	27
Azurna	Azure	7	8.4	27.5	15.00	25	.01	28	.02	28
Metalik	Metallic	6	7.2	29	16.67	29	.01	29	.02	29

Note. f – frequency of the term, f(%) – frequency of the term in percentage, R_f – rank based on frequency, MP – mean position of the term, R_{MP} – rank based on mean position, S – Cognitive salience index, R_S – rank based on Cognitive salience index, C – Smiths' C salience index, Rc – rank based on Smiths' C salience index.

* Values of S index for Serbian colour terms: *purpurna, ružičasta, indigo, azurna,* and *metalik* are .008, .008, .005, .005, .004 respectively, but are rounded at .01 for consistency in data presentation.

The first and the most general finding is that Serbian counterparts of the BCTs proposed by Berlin and Kay (1969) occupy the top positions (Table 1).

Frequency of colour terms

For estimating a cut-off in colour-term frequencies, Borgatti (1999) proposed plotting the elicited terms' frequencies and searching for natural breaks in the distribution. In the function Figure 1 prompts the first break between terms *braon* 'brown' (rank 11) and *bordo* 'dark red' (rank 12). This break might represent the hurdle between BCTs and non-BCTs, but we should be cautious with this interpretation since a smaller yet noticeable break can be observed between the colour terms ranked 1–9 and the other two terms – *roze* 'pink' and *braon* 'brown'.

The second break in frequency function is of particular interest in view of the additional aim of the present study: it is located between non-basic term *teget* 'dark blue' (rank 15, frequency of 51.8%) and *krem* 'cream' (rank 16, frequency of 37.3%). As it can be seen in Figure 1, there is a group of terms positioned between 11 BCTs proposed by Berlin and Kay (1969) and non-BCTs with frequencies lower than 40%. The terms that form a seemingly distinctive group are *bordo* 'dark red' (f = 67.5%), *tirkizno* 'turquoise' (f = 65.1%), *oker* 'ochre' (f = 57.8%) and *teget* 'dark blue' (f = 51.8%).

Zipf-function presented in Figure 2 reveals three parts of the function, with each characterised by a different slope. The first limb is represented by nine BCTs elicited by almost all participants (f > 95%, *plavo* 'blue', *zeleno* 'green', *crveno* 'red', *žuto* 'yellow', *ljubičasto* 'purple', *narandžasto* 'orange', *crno* 'black', *belo* 'white', and *sivo* 'grey'), whose slope is almost zero, -0.024 (Figure 2). The second one includes two BCTs *roze* 'pink' and *braon* 'brown', as well as terms *bordo* 'dark red', *tirkizno* 'turquoise', *oker* 'ochre', and *teget* 'dark blue' with the slope of -1.206. All other less frequently used non-BCTs form the third limb of the function with the steeper slope of -2.964.

The division of the function into three (instead of the expected two) regimes is similar to the one obtained in the study of the American English colour lexicon (Lindsey & Brown, 2014). Authors of this study discussed that the additional division of the function might represent the difference between terms that are commonly used in daily communication and are possibly becoming BCTs (second regime) and the ones that are not commonly used (third regime). We reckon that the same explanation can be applied to our data: the observed change in the function after 15th term distinguishes terms that can be considered as actively used among Serbian speakers from those with a very low popularity. Terms *bordo* 'dark red' and *teget* 'dark blue' fall under the second regime of this function (and are marked on the Figure 2), which suggests their common usage in the Serbian language. Interestingly, in the study of Lindsey and Brown (2014), 11 BCTs according to Berlin and Kay (1969) were used by all participants and therefore were all included in the first regime of the function. In our study, however, *roze* 'pink' and *braon* 'brown', with frequencies of 85.5% and 79.5%, respectively, were better fitted with the group of frequent non-BCTs. This result is in line with the smaller break between nine BCTs and terms *roze* 'pink' and *braon* 'brown', which we observed when we plotted frequencies as proposed by Borgatti (1999).

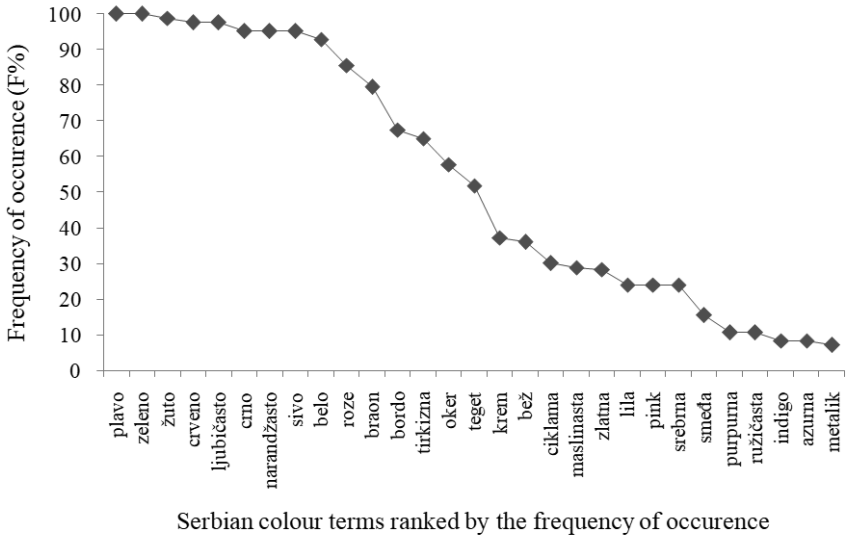

Figure 1. Frequency of occurrence *f*(%) of colour terms (N = 29) ranked by the frequency of occurrence *f* (see Table 1).

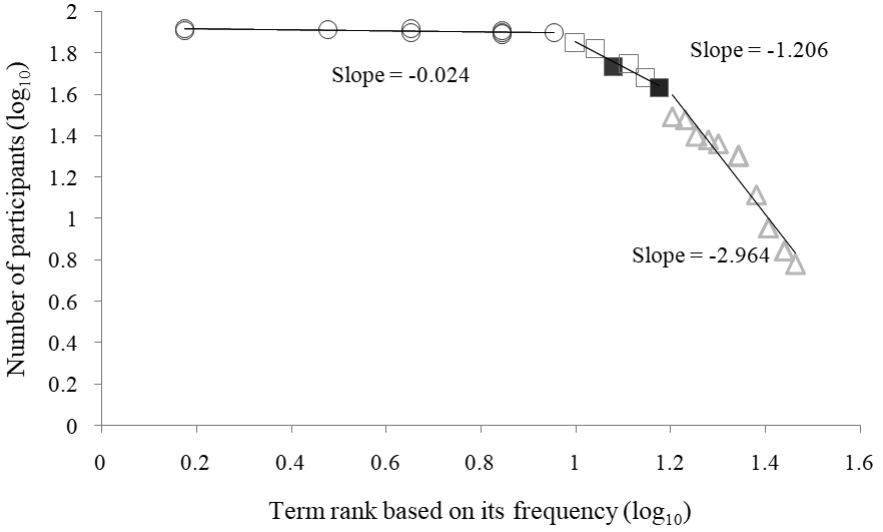

Figure 2. Colour-term popularity diagram, or Zipf-function of Serbian colour-term frequency; *x*-axis: $\log_{10}$ of the term rank based on its frequency (R_f), *y*-axis: $\log_{10}$ of the number of participants listing the term. Note that the values of some terms almost completely overlap due to their identical frequency (e.g., *plavo* and *zeleno* are represented on the 1st circle and *crno*, *narandžasto*, and *sivo* are represented on the 4th circle, see Table 1).

Mean position of colour terms

Mean position (MP) of the term enables to separate primary from derived basic colour terms, manifested by a MP gap between these two BCT types (Hippisley et al., 2008). As it can be seen in Table 1, in our study, MPs of primary BCT vary between 3.716 (*crveno* 'red') and 6.265 (*crno* 'black') while MPs of derived BCTs vary between 7.913 (*ljubičasto* 'purple') and 11.242 (*braon* 'brown'). These results are similar to those obtained for Hungarian (see Uusküla & Sutrop, 2007). Again, the highest ranked terms were BCTs according to Berlin and Kay (1969), with an exception of *tirkizno* 'turquoise' ranked 11 before *braon* 'brown' (rank 12), with MP 10.629 (Table 1). In Figure 3, we additionally plotted MP values on a logarithmic scale ranked in increasing order as suggested in some recent studies (Uusküla & Bimler, 2016). As it can be seen, the term *braon* 'brown' is ranked among terms that are non-BCTs according to Berlin and Kay (1969). Similar to the ranking order for the frequency, *braon* 'brown' is followed by *oker* 'ochre' and *bordo* 'dark red', with similar values of MPs: 11.458 and 11.642, respectively. In comparison, term *teget* 'dark blue' has MP = 13.302 and is ranked 19 (Table 1).

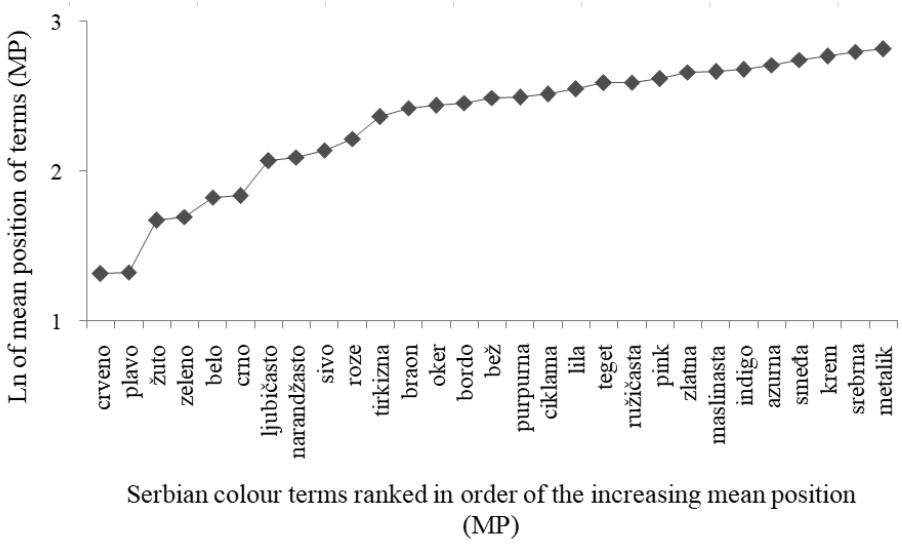

Figure 3. Ln MP of Serbian colour terms ranked in order of the increasing mean position (see Table 1).

Cognitive Salience index (S)

To overcome differences in terms' ranking according to their frequency and MP, we additionally calculated cognitive salience index S (Sutrop, 2001). Again, the first 11 ranked colours in the Serbian language followed the Berlin

and Kay's (1969) scheme of universal colour categories – primary and derived BCTs respectively. Terms *crveno* 'red' (S = .266) and *plavo* 'blue' (S = .262) reveal the highest cognitive salience index S. Estimated cognitive salience was plotted on a logarithmic scale ranked in order of decreased salience (Figure 4). As it can be observed, there is no sharp cut-off between BCTs and non-BCTs that were defined by Berlin and Kay (1969). The values in Table 1 and the distribution in Figure 4 seems to show that the larger cut-off exists between *roze* 'pink' (S = .093) and *braon* 'brown' (S = .070) than between *braon* 'brown' and *tirkizno* 'turquoise' (S = .061). In other words, based on the cognitive salience index, a boundary can be observed within Berlin and Kay's BCTs, cutting off the term *braon* 'brown', whose salience seems to be more similar to the salience of several non-BCTs.

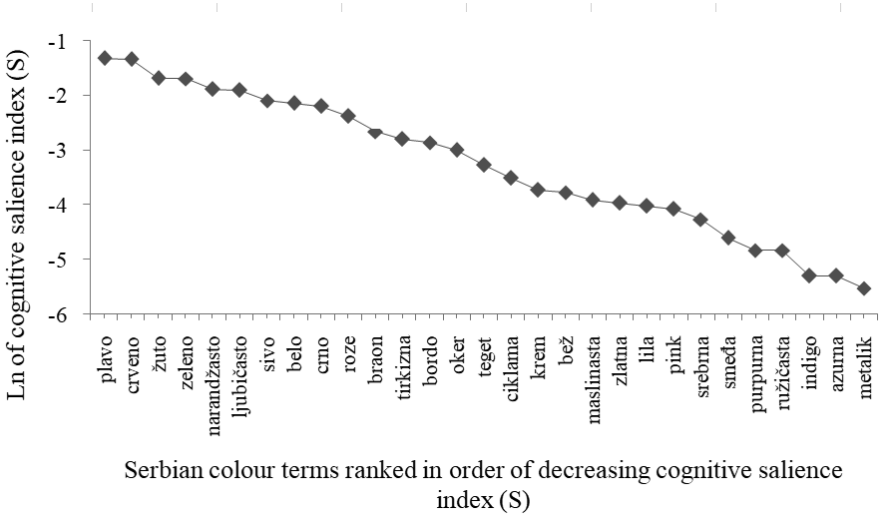

Figure 4. Ln (S) for Serbian colour terms ranked in order of decreasing cognitive salience index S (see Table 1).

Smith's Free Salience index (C)

Figure 5 and Table 1 show Serbian colour terms ranked by decreasing order of Smith's C index (Smith, 1993; Smith et al., 1995). The order of color terms ranked by this index is identical to the order we established using the cognitive salience index (Sutrop, 2001): the first 11 positions are occupied by 11 BCTs proposed by Berlin and Kay (1969), followed by *tirkizno* 'turquoise', *bordo* 'dark red', *oker* 'ochre' and *teget* 'dark blue'. Again, the difference in C index salience between basic terms *roze* 'pink' and *braon* 'brown' is more noticeable than the difference between BCT *braon* 'brown' and *tirkizna* 'turquoise' and *bordo* 'dark red', the latter being not BCTs according to Berlin and Kay (1969).

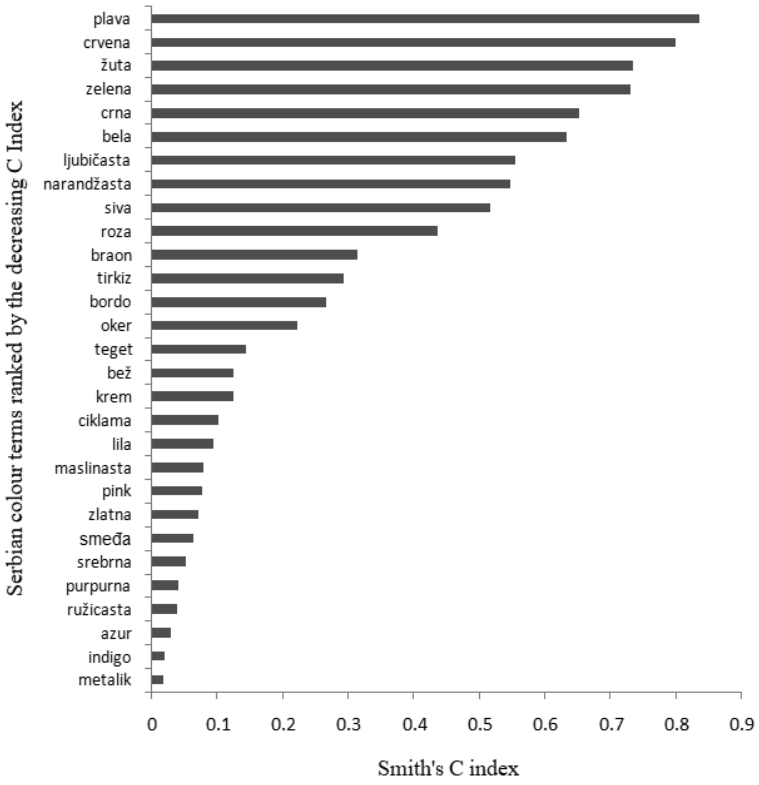

Figure 5. Serbian colour terms ranked by the decreasing Smith's C index (see Table 1).

Discussion

This study is a first attempt that used behavioural measures to establish the inventory of BCTs in the Serbian language and investigate the status of colour terms *teget* 'dark blue' and *bordo* 'dark red'. The list task (Morgan & Corbett, 1989) enabled us to calculate the frequency of elicited colour terms, their mean position on participants' lists and two cognitive salience indexes – S (Sutrop, 2011) and C (Smith, 1993). Based on both salience indexes, 11 most salient Serbian colour terms are 11 BCTs proposed by Berlin and Kay (1969): *plavo* 'blue', *crveno* 'red', *žuto* 'yellow', *zeleno* 'green', *crno* 'black', *belo* 'white', *ljubičasto* 'purple', *narandžasto* 'orange', *sivo* 'grey', *roze* 'pink', and *braon* 'brown'. However, a more detailed look into the measures obtained in this study shows that we have to be cautious with the conclusion that (only) these terms represent candidates for BCTs in Serbian language. Moreover, we can say that for determining BCTs in the Serbian language, further research is required using other measures: behavioural, such as response times, consensus and consistency in colour naming, etc. and linguistic, such as frequency in texts.

First of all, above listed 11 BCTs were not elicited from all participants. According to Berlin and Kay's theory (1969), BCTs are used by all or almost all speakers of a language. By having the frequency of occurrence higher than 95%, we can say that first nine ranked colours in the Serbian language (*plavo* 'blue', *crveno* 'red', *žuto* 'yellow', *zeleno* 'green', *crno* 'black', *belo* 'white', *ljubičasto* 'purple', *narandžasto* 'orange' and *sivo* 'grey') fulfil this requirement. However, terms *roze* 'pink' and *braon* 'brown' showed lower frequencies of 85.5% and 79.5% respectively. This is apparent in the Zipf-like function of frequencies (Figure 2). Namely, in accordance with Berlin and Kay's theory (1969), we expected to observe two regimes of this function with significant difference in slope after 11 terms, which would suggest the boundary between BCTs and nonBCTs in the Serbian language. However, term-popularity data was better fitted with the three-regimes function, which is similar to the one obtained for American English (Lindsey & Brown, 2014). The first nine ranked terms showed near-zero slope suggesting that those terms are firmly established in the Serbian colour vocabulary and can be considered as BCTs (Figure 2). The last 14 ranked terms with frequencies less than 40% (Table 1) formed a third regime with a steep slope (-2.964), from what follows that they represent nonBCTs with low frequency. However, the 'middle' regime, whose slope was around -1 (Figure 2) is particularly interesting, containing two of the Berlin and Kay's BCTs – *roze* 'pink' and *braon* 'brown' and four nonBCTs – *bordo* 'dark red', *tirkizno* 'turquoise', *oker* 'ochre' and *teget* 'dark blue. Based on that, we can conclude that these six terms, together with the first nine ranked terms, form a colour vocabulary that is commonly used and understood among Serbian speakers. However, the question of their BCT status requires further elaboration.

If we consult measures of salience collected in this study (S and C in Table 1), we can observe a salience gap after the first ten ranked terms (including *roze* 'pink') and before the term *braon* 'brown'. Therefore, we can also include *roze* 'pink' in the BCT inventory of the Serbian language. However, the status of *braon* 'brown' is peculiar, in particular if we bear in mind that we did not observe expected differences in salience or any other measure between this term and several non-basic terms (especially terms *tirkizno* 'turquoise' and *bordo* 'dark red'). Moreover, *tirkizno* 'turquoise' showed lower mean position on participants' lists than *braon* 'brown'.

Based on these results, we could discuss that *braon* 'brown' does not have basic status in the Serbian language, as well as *tirkizno* 'turquoise' and *bordo* 'dark red'. If we look at the term brown in studies that considered it to be a BCT in certain languages, we can see that it usually occupies 8th or 9th salience rank with the value of cognitive salience index of around 0.090 (Uusküla & Bimler, 2016; Uusküla & Sutrop, 2007), while in our study it showed an index of 0.070. More importantly, it was followed by the term *tirkizno* 'turquoise' with the similar value of this index.

On the contrary, we could consider *braon* 'brown' to be a BCT, together with terms *tirkizno* 'turquoise' and *bordo* 'dark red'. In the study of Hungarian colour terms (Uusküla & Sutrop, 2007), the term *bordó* is considered to be a candidate for a BCT by being the 12th ranked colour with cognitive salience index S = 0.044. Also, recent study suggested that turquoise might be acquiring a BCT status in the English language (Mylonas & MacDonald, 2016). Therefore, we could discuss Serbian terms *tirkizno* 'turquoise' (rank 12, S = .061) and *bordo* 'dark red' (rank 13, S = .057) in the same manner. One more possibility has to be addressed at this place. Namely, 13 participants in our study listed the term *smeđa*, which Serbian speakers use to denote brown hair. However, 38% of them listed it without listing *braon* 'brown', suggesting that, for some Serbian speakers, these two terms might represent synonyms. Consequently, this might have lowered the overall frequency and saliency of the term *braon* 'brown' and concealed its BCT status. Since data collected in this study cannot be used for resolving this question, this needs to be addressed in future studies.

To conclude, our results show that in Serbian ten colour terms definitely have basic status: *plavo* 'blue', *crveno* 'red', *žuto* 'yellow', *zeleno* 'green', *crno* 'black', *belo* 'white', *ljubičasto* 'purple', *narandžasto* 'orange', *sivo* 'grey', and roze '*pink*'. Also, one cannot exclude that Serbian BCT inventory includes *braon* 'brown' and might extend beyond the 11 BCTs proposed by Berlin and Kay (1969), to include some of the salient and frequently used nonBCTs. However, based on the approach of the existing similar studies in the field (Androulaki et al., 2006; Hippisley, 2001; Uusküla, 2007; Uusküla & Sutrop, 2007), the safest conclusion from the collected data would be that *bordo* 'dark red' and *teget* 'dark blue', which were in the special focus of this study, represent salient non-BCTs in the Serbian language. This is particularly likely for the term *teget* since it was ranked around 15th place according to all measures calculated.

Since this study represents the first empirical study of colour naming in the Serbian language, a few limitations should be considered. First, our sample was gender-unbalanced, including 71 females and 12 males. Previous studies (e.g., Lindsey & Brown, 2014; Mylonas, Paramei, & MacDonald, 2014; Uusküla, 2008) showed gender differences in colour naming demonstrating that women use more colour terms in general and more non-basic colour terms. Therfore our unbalance sample might have caused higher frequency of the term *smeđa* (used to describe brown hair), possibly lowering the frequency of usage of the term *braon* 'brown'. Even though we could say that our sample was unbalanced in the direction of a part of the population that is "superior" in the list task, future studies will need to examine outcome of a balanced sample and, also, explore possible gender differences in order to further examine the inventory of Serbian colour terms.

Second, previous studies have revealed that certain terms tend to show some, but not all characteristics of basic colour terms. For example, even though the Ukrainian term *salatnyj* (light green) showed high frequency of occurrence, with 76% and rank 12 in the list task (Hippisley, 2001), it has not been considered

a candidate for a BCT since its frequency of occurrence revealed a noticeable gap in relation to that of *fioletovyj* 'purple', 88% and ranked 11. On the other hand, term *karyčnevy* 'brown' in the Belarusian language showed frequency of only 54% and rank 44, but it has been classified as BCT since it was ranked as 10th according to its mean position on participants' lists (Hippisley, 2001). Also, in the study of the Czech colour terminology, it has been demonstrated that term *beige* was highly ranked by the measures collected in the list task, while consistency in the colour-naming of this term was low, which suggested its non-basic status (Uusküla, 2008). In other words, even though the list task is considered as an effective measure separating basic from non-basic colour terms, sometimes it does not provide a sharp cut-off between them, and, therefore, needs to be combined with other measures (Corbett & Davies, 1995).

In order to further investigate Serbian colour terminology, we propose administrating a colour-naming task, which is often used along with the elicitation task (Androulaki et al., 2006; Corbett & Davies, 1995; Uusküla, 2007, 2008; Uusküla & Sutrop, 2007). A colour-naming task provides measures such as consistency, consensus and response times of colour naming, which are high for basic colour terms and, thus, can significantly contribute to identification of the BCTs inventory (Bimler & Uusküla, 2017). Conversely, non-basic terms tend to be named slower, consensus of tile naming is lower, and the range of colours they denote is significantly smaller (Bimler & Uusküla, 2017; Boynton & Olson, 1990). Therefore, obtaining other behavioural measures may help resolving the problem of ambiguous status of the Serbian colour terms addressed above. Also, linguistic measures, such as frequency in texts, are considered useful for revealing subtle differences within the BCT inventory (Corbett & Davies, 1995), which might be of a particular help understanding the status of the term *braon* 'brown' in the Serbian language.

Even though this study did not succeed to unambiguously determine Serbian BCT inventory, it revealed that speakers of Serbian language frequently use 15 colour terms – 11 BCTs proposed by Berlin and Kay (1969) together with terms *bordo* 'dark red', *tirkizno* 'turquoise', *oker* 'ochre' and *teget* 'dark blue'. Recent studies conducted in Italian (Paggetti, Menegaz, & Paramei, 2016) and English (Lindsey & Brown, 2014; Mylonas & MacDonald, 2016) support this, showing that in modern languages colour terminology is evolving with a few previously considered non-BCTs having become salient and frequently used. We believe that this might be happening with the Serbian language as well and that future studies need to look beyond originally proposed 11 BCTs in order to understand the Serbian colour vocabulary.

In the Part 2 of this study (Jakovljev & Zdravković, 2018) the salient colour terms *teget* 'dark blue' and *bordo* 'dark red' identified in the present study were further examined. In particular, we further assessed their cognitive salience by investigating categorical effect of each using a simultaneous discrimination task, employing *plavo* 'blue'– *teget* 'dark blue' and *crveno* 'red' – *bordo* 'dark red' stimulus sets respectively.

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Leksikon boja u srpskom jeziku – studija kategorija tamno plave i tamno crvene boje I deo: Zadatak izlistavanja boja

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U ovoj studiji ispitivana je terminologija boja u srpskom jeziku. Primenili smo zadatak izlistavanja boja kako bismo utvrdili inventar osnovnih naziva za boje u našem jeziku, a zatim i ispitali kognitivnu zasićenost i status naziva *teget* (tamno plava) i *bordo* (tamno crvena). Ispitanici čiji je maternji jezik bio srpski ($N = 83$) su radili zadatak izlistavanja boja (Morgan & Corbett, 1989) u kome su, u vremenskom periodu od pet minuta, navodili sve srpske nazive za boje koje znaju. Na osnovu prikupljenih podataka je izračunata učestalost javljanja svakog naziva, njegova prosečna pozicija na listama i dva tipična indeksa kognitivne zasićenosti. Rezultati su pokazali da 11 najzasićenijih naziva za boje u srpskom jeziku odgovara osnovnim nazivima za boje predloženim od strane Berlina i Keja (1969): *plavo* 'blue', *crveno* 'red', *žuto* 'yellow', *zeleno* 'green', *crno* 'black', *belo* 'white', *ljubičasto* 'purple', *narandžasto* 'orange', *sivo* 'grey', *roze* 'pink' i *braon* 'brown', ali da status naziva *braon* u srpskom jeziku zahteva dodatna istraživanja. Nazivi *teget* (tamno plavo) i *bordo* (tamno crveno), zajedno sa nazivima *tirkizno* i *oker*, pokazali su se kao nazivi koji se često koriste i čija je kognitivna zasićenost veća od zasićenosti drugih ne-osnovnih naziva. Dalja istraživanja su neophodna da bi se utvrdilo da li nazivi *teget* i *bordo* zadovoljavaju kriterijume za osnovne boje u srpskom jeziku.

Ključne reči: termini za boje, srpski jezik, zadatak izlistavanja boja

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