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The Effects of Bilingualism on Basic Color Terms in Persian

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Abstract

This study is to determine how bilingualism could influence the list of Persian basic color terms and their order. Using a monolingual Persian and a bilingual Kurd sample students, and a color list task, it is assumed that bilingualism could change the ordering of the non-basic color terms in the second language, but not the basic ones. Another assumption is that, the old usual methods for obtaining mean position and saliency, based on Sutrop (2001) would not determine the BCTs in Persian. The data suggest that Persian has 6 BCTs; Qermez, Âbi, Sabz, Zard, Siyâh, and Sefid. The BCTs are retrieved by monolinguals much faster than bilinguals. Mean Position and frequency in school and university students had differences in number supporting the hypothesis that staying for more than two years in a bilingual environment and L2 use frequency are the two effective factors in BCTs order.

Keywords: Sequential Bilinguals, Basic Color Terms, Persian, List Task, Kurds

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1. Introduction

In the past fifteen years, there has been a new surge of interest in the theory of linguistic relativity, otherwise known as the Sapir-Whorf hypothesis (Kroll & De Groot, 2005). For Whorf, the "linguistic relativity hypothesis" means, in informal terms, that "users of markedly different grammars are pointed by their grammars toward different types of observations and different evaluations of externally similar acts of observation, and hence are not equivalent as observers but must arrive at somewhat different views of the world" (Whorf, 1956, p. 221). The goal of neo-Whorfian inquiry is to examine the influence of language, be it structures or discourses, on thought. Thought is typically defined in two ways: some scholars focus on the contents of thought, that is, speakers' conceptualizations of the world, while others examine the processes of thinking, such as attending, remembering, or reasoning (Lucy, 1992). A concise historical account of the linguistic relativity hypothesis can be found in numerous articles, some specifically related to bilingualism (see e.g., Pavlenko, 2011).

Studies concerning color terms took a linguistic flavor by Jakobson (1941) and Greenberg (1966, 1969 & 1975). The studies on color terms are carried out in two phases (Lucy & Shweder, 1979). Until early 1970s, it was presumed that the colors' spectrum is, conventionally, divided into categories that correspond to the words contained in it. In the second phase of studies, the general premise changed from cultural relativism, to color universals (Davies & Corbett, 1997).

The base of linguistic studies of color terms was founded in 1969, due to Berlin and Kay's study (1969) and their subsequent publishing of *Basic Color Terms: Their Universality and Evolution*. They found that there are universal restrictions on the number of Basic Color Terms (BCT) that languages can have and the ways in which the languages can employ these terms. They studied

twenty different languages from a number of different language families and identified eleven possible basic color categories: white, black, red, green, yellow, blue, brown, purple, pink, orange, and grey. Their universal color hierarchy includes 7 developmental stages, as follows:

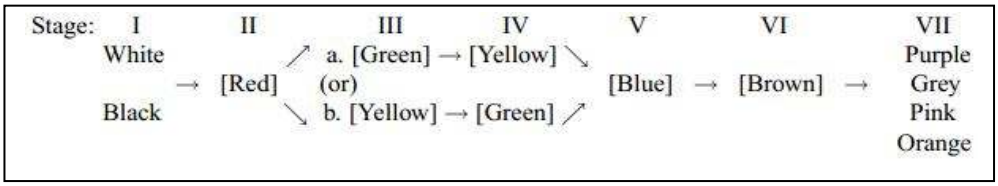

Figure 1. Temporal-evolutionary Ordering of Basic Color Terms after Berlin and Kay (1969)

The languages with less than 11 BCTs (rarely more than 11 basic color terms are in a language) follow the pattern in Figure 1. All languages have the *black* and *white* terms, or some terms related to them (stage 1). If a language has 3 BCTs, then the third term is *red* (stage 2). The fourth term is either *green* or *yellow*, in languages with 4 and 5 BCTs (stages 3 and 4). If a language has a particular basic color term, then it should also already entail all the earlier basic color terms of the hierarchy (Uusküla, 2007).

English has 11 BCTs and is on the top of the hierarchy, and the Dani language, with 2 BCTs is on the outset of the hierarchy (Heider, 1972). Dani, as an example of a language with little maturity of science and culture, refers to other colors with relatively complex words and some objects related to those colors (e.g., *orange* in English). In order to be considered a basic color category, the term for the color in each language has to meet certain criteria:

1. It is monolexemic; In Persian, /âbi/ (blue) is a BCT, but /âbi kam-rang/ (light blue) is not.
2. What it signifies should not be included in that of any other color term (the term must not be as "a type of" one); In Persian, /noxodi/ (pale goldenrod) is a type of "yellow"; hence, it is not a Persian BCT.

3. Its application must not be restricted to a narrow class of objects (for example, *blonde* in English is restricted to hair and wood); In Persian, /bolond/ (blonde) is not a BCT, because it just refers to the color of the hair.
4. It must be psychologically salient for informants (for example, "the color of grandma's freezer" is not psychologically salient for all speakers) and also the term must not be salient for only a special group or profession, for example dyers or interior designers. In Persian /katâni/ (linen), /pulâdi/ (slate) and /sorbi/ (light slate gray) are technical terms for special occupations and non-BCTs.
5. Color terms that are also names of an object or loan words, are not BCTs. In Persian, the terms /šokolâti/ (chocolate) or /bež/ (beige) are loan words; /xâki/ (khaki) and /gojeyi/ (tomato) are colors of /xâk/ (soil) and /goje/ (tomato), respectively.

Persian BCTs are not well studied. Amouzadeh, Tavangar, and Sorahi (2012) have studied metaphors which use BCTs in Persian and they have mentioned that there are 5 BCTs in Persian. Their findings are based on Berlin and Kay's (1969) linguistic criteria in determining BCTs. Accordingly they have stated that /âbi/ (blue) is not a BCT, since it refers to /âb/ (water). Mahootian (1997) also divides the BCTs into simple and derived terms. She considers /âbi/ (blue) to be a non-BCT, as it is derived from /âb/ (water).

Unlike Persian, there are many studies on BCTs in different languages (Witkowski, 1982; Davies & Corbett, 1994; Uuskula, 2007 & 2008, & Al-Rasheed, 2008), some of which (especially Uuskula, 2007 & 2008) follow the same methodology and theoretical framework, used in the present study. The framework is explained in section 2 (based on Sutrop (2001)). Some studies have attempted to synthesize some of the available evidence on the relationship

between the linguistic relativity hypothesis and bilingualism (Athanasopoulos & Aveledo, 2012, p. 250). Color scope presents an ideal test case of the nature of bilingual concepts (Kroll & De Groot, 2005, p. 6). In the domain of color perception, some researchers showed that bilinguals shifted the boundaries and the prototypes of their native color categories towards those of monolingual speakers of their L2 (Athanasopoulos & Aveledo, 2012, p. 240). Some researchers, like Athanasopoulos (2009 and 2011) focused on non-linguistic cognitive processing such as categorization and perception. In studies of Greek and Japanese bilinguals', he (Athanasopoulos, 2009 and 2011) showed that bilinguals who used English more frequently distinguished the shade of blues less well than those who used Japanese and Greek more frequently. The frequency of language use and the length of staying in L2 language environment were important factors in his tests. Athanasopoulos (2007, 2006) and Athanasopoulos and Kasai (2008) also found that increasing proficiency in the L2 was the best predictor of the degree to which Japanese–English bilinguals shifted their similarity judgments of countable objects and non-countable substances towards those of monolingual speakers of English. Athanasopoulos et al. (2010), among others, made the investigation of bilingual color perception biological, through the use of neurophysiological techniques. Their bilinguals were successive bilinguals, not sequential ones.

The aim of the present study is to determine how bilingualism could influence the list of Persian basic color terms and their order. Accordingly, two samples of Persian speakers, a monolingual sample and a sample of bilingual students (whose second language was Persian and Kurdish was their first language) were tested, using procedures similar to study of Chichewa (Davies et al., 1995). Hence, the present study used a color list task. It is expected that basic terms would occur in most informants' lists (and in high positions on

these lists) and that there would be similar understanding among speakers as to what the terms denote. It is argued that the BCTs have the higher frequency and lower mean position than non-basic ones. In simpler terms, they come to the speaker's mind (the retrieval of BCTs) much faster. Hence, the researchers assume that bilingualism could change the ordering of the non-basic color terms in the second language, but not the basic ones. Increasing proficiency and the second language encounter time are two factors which affect the bilinguals' behavior and derive them to behave more like monolinguals. Another assumption is that, the old usual methods for obtaining mean position and saliency, based on Sutrop (2001) would not determine the BCTs in Persian, since monolinguals and bilinguals' terms and the difference between their lists' trend would not be so exact to have clear and exact results. Hence to find out the effect of bilingualism on BCTs, we have used a new method which is described in section (2).

2. Methodology

2.1. Participants

The participants were divided into two groups: monolingual Persian speakers and bilingual Persian speakers (which Persian was their second language, and Kurdish was their first language). The Kurdish participants were from Kalhori dialect of southern Kurdish language, also called Kermānšāni, which is one of the Northwestern Iranian languages; they all speak Persian in their schools and universities and speak Kurdish in their homes as native language. The primary school children were in low level of fluency in Persian since they have stayed less than two years in a bilingual environment and they used L2 lower than university students. To test the effects of the first language (Kurdish) on the bilinguals' second language (Persian), they were tested in Persian. In the first

group (monolinguals), there were 60 college students (between 18 to 30 years old and with equal sex distribution=30 male and 30 female) and 60 elementary-school students (between 7 to 9 years old and with equal sex distribution=30 male and 30 female). The second group (bilinguals) was organized like the first group.

To make the data reliable, the kind of bilingualism was kept fixed. There are 2 kinds of bilinguals: simultaneous bilinguals and sequential bilinguals. According to De Houwer (1996), simultaneous bilingualism takes place in "children who are regularly addressed in two spoken languages from before the age of two and who continue to be regularly addressed in those languages up until the final stages" of language development. Both languages are acquired as first languages. This is in contrast to sequential bilingualism, in which the second language is learned not as a native language but a foreign language. All the participants of the present study were sequential bilinguals. All the participants of the present study were sequential bilinguals. Their teacher was a native speaker of Kurdish; he was their teacher for 6 months and he checked their proficiency in Kurdish in this period and by reference to a native speaker (their teacher), they were Kurdish-Persian bilinguals. Access to sequential bilinguals was a beneficial factor in this study, which Athanasopoulos (2010) had not. It means that his participants might be mixed by the 2 kinds of bilinguals. Furthermore, the length of staying in a bilingual environment is tested through the division of the participants in 2 groups on the basis of their contact length with Persian.

The adult participants were students of Bu-Ali Sina University, Jahad Daneshgahi University, Hamedan city, and Sharif University of Technology, Tehran, Iran. The monolingual children were students of Moallem elementary school in Malayer and Shahid Farahani and Ibne Sina elementary schools in

Hamedan city; and the bilingual children were students of Shahid Safari and Ibne Sina elementary schools in Asadabad, Hamedan province, Iran. Regarding children's participation in the study, the special permissions were taken due to Iran's local laws, from Bu-Ali Sina University and Hamedan Education office. None of the participants were aware of the topic of the test they participated in, until its beginning.

2.2. Instruments

The original procedure for identifying basic color terms that Berlin and Kay (1969, pp. 5-7) used for collecting their data consists of two tasks: list task (elicitation of basic color terms) and color mapping (indication of both focal point and the outer boundary of each of his basic color terms on the Munsell color chip array). This procedure was very time-consuming (Uusküla, 2008). Later, based on this procedure, Davies and Corbett (1994) and Davies et al. (1995) devised a new, simple, and quick method for identifying BCTs, which was considered as a field method rather than a laboratory method.

This article is based on Davies and Corbett (1994), Davies et al. (1995), and Davies et al. (1999) field method; but because of the aim of the article, the study exclusively focuses on the list task; and it skips the naming task and best exemplars. With the help of the list task, the participants were interviewed in the university classes and some schools.

The participants were asked "please tell me as many color terms as you know". The experimenters gave the guidelines to participants (writing their first and second language, their age, and sex, in order and in Persian). The participants were given two minutes for writing the color terms down in Persian, after the instructions. They were encouraged to write down as many color terms as they know, within the two minutes. If the task time is limited to

for instance two or five minutes, then the using test will be considered as a restricted list task type. If there is no temporal limit (i.e., the interviewer asks, "Please name all *X*s that you know," and after the informant stops listing *X*s the interviewer asks, "Do you know more *X*s?"), then the task would be a free-list task type. In most cases, this distinction between restricted and free-list tasks is irrelevant. Hence, simply the name list task can be used (Sutrop, 2001, p. 2). In the present study the list task was a restricted one. Prior to testing, participants were engaged in small talk in Persian and the researchers asked them to write their names, age, and sex in an effort to induce the relevant language and also to distract the participants' attention from the topic of the study.

The primary analyses of the data including frequency and mean position analyses were obtained through C++ and Java programming language, and some other analyses were carried out in Microsoft Excel 2007, to further guarantee the precision and exactitude of mean position and saliency results. It was supposed that the basic color terms have higher frequency and lower mean position than non-basic ones. This means that they come to one's mind much faster. And, bilingualism has an effect on the ordering of the color terms in Persian, but not on the basic ones (see e.g., Uuskula, 2007 & 2008; Al-Rasheed 2008).

2.3. Data Collection Procedure

In the list task, four factors were analyzed: first mentioned terms, frequency, mean position, and saliency. The list task characterizes every named color term by two parameters – the frequency of the word, i.e. how many participants named each color term, and the mean position, i.e. in which position in the sequence the color term was named on average. The rationale for deleting low-

frequency terms is that they are not in active use (in that language). The low-frequency terms are either in passive use or are used only in some idiolects, like /kâhuyi/ (verde) and /sefide kasif/ (dirty white). Of course, a domain defined by deleting low-frequency terms (deleting arbitrarily or according to a natural break) contains many passive terms. Therefore, the second list task parameter, the mean position of a term, is also important for defining the terms in active use in a domain (Sutrop, 2001, p. 3). The mean position of a term is calculated only from individual lists containing that term. It is generally accepted that there is a good correlation between the frequency and mean rank of a term (i.e., the most frequent terms are named first and the terms that are named only by a few participants are named last) (Bousfield & Barclay, 1950).

In the present study on Persian BCTs, a new mean position was obtained based on the terms' value to have the exact results: in the way that the first term in a list has a higher value, comparing the length of that list (L). For example the first term in a list with 13 terms, would have value 13, and the value of the last one would be 1; and the value of a non-mentioned term in the list would be 0. The formula of mean position by value would be as follows:

$$(P/L) \text{ by value} = (L+1)-P$$

In which, P is position of a term and L is word length of the participants' list.

To establish (cognitively) the basic terms in a domain (in most cases these are morphologically simple, short, and native words) there are some criteria for ordering the terms and discriminating the salient group of basic terms from the non-basic ones. The frequency measure or the mean position of a term alone is not sufficient. Both measures give different sets of candidates for BCTs. For that reason, it seems the frequency and mean position of a term could be combined into a cognitive salience index, while salience mentions the two factors simultaneously (Sutrop, 2001, p. 4). Defining the basic color terms,

Berlin and Kay wrote that indices of psychological salience included, among others, (1) a tendency to occur at the beginning of the elicited lists of color terms, (2) stability of reference across participants and across occasion of use, and (3) occurrence in the idiolects of all participants (Greenberg, 1969, p. 6). As Sutrop (2001, p. 5) indicates, the formula for salience is as follows:

$S = F/(N\,mP)$.

The dividend considers the frequency (F) with which a term is named in the list task. The divisor NmP considers the weight of the mean position (mP) in which the term is named, and N is the number of participants. If all participants have named a term (F=N) and the mean position of that term is 1, then the salience (S) is also 1 for that term. The cognitive salience index varied between 1 and 0.

The cognitive salience index gives comparable results between different investigations, as it does not depend on the length of the individual lists. To have more accurate results, the length of lists was mentioned in this study. It seems that the fourth term in a 4-term list is more salient than the 20th term in a 30-term list. To include the length and rank factors in studies, Sutrop (1998 and 2000) obtained a new formula as follows:

$$S = (F/N)[(L - mP)/(L - 1)]$$

The first factor, F/N, considers the frequency (F) with which a term is named in the list task and N is the number of participants. If all participants name a term, then this factor will be 1 for that term. The second factor, (L–mP)/(L–1), considers the weight of the mean position (mP) in which the term is named; L is a parameter that takes into account the length of the lists (L is the mean length of the individual lists). If the mean position is 1, this factor is also 1. Calculating salience based on Sutrop (1998 and 2000) and comparing to Smith and Borgatti (1997), the results show the better correlation in the second one, in both mono and bilinguals; and because of the influence of frequency (as

a factor in being BCT), in this study the combination of both were obtained. Smith and Borgatti's (1997) formula is as follows (R=position of the term in each list):

$$S = \left(\sum\left(\left(L_i - R_j + 1\right)/L_i\right)\right)/N$$

In the present study the salience is named as the mixed (shown in table 5) one and obtained as:

$$\boldsymbol{S_{mix}} = \frac{F}{N}\sum\left((L - R) + 1\right)/L$$

2.4. Data Analysis and Results

In this subsection, the findings of the mentioned test are presented. With the help of the mentioned factors, the data had been analyzed, which are presented separately and then integrated.

Some of the terms which are expressed by participants had variations, which are integrated for the easier analysis. The terms like /keremi/ (bisque), /lajani/ (yellow green), /yašmi/ (dark green), and /pesteyi/ (green yellow) were also mentioned /kerem/, /sabze-lajni/, /sabze-yašmi/, and /maqz-pesteyi/ or /pust-pesteyi/, respectively. /tusi/ (silver) and /xâkestari/ (gray) seems to be in lexical adaptation, but in this study they are taken as two separate terms, since some of the participants had mentioned both terms in their lists; it is also the case for /sorx/ (red) and /qermez/ (red). All of the terms which were different in lexical structure (but maybe the same as hue), had been taken as 2 single and separate words, like /âbi-tire/ (dark blue) and /âbi-nafti/ (corn flower blue), /qahveyi-tire/ (dark brown) and /qahveyi-suxte/ (coffee). The terms that were listed only by a single informant or by very few participants considered as accidental/occasional terms.

Entirely, the participants (N=240) offered 3313 terms, with the mean of 13.80 terms for each. Bilinguals mentioned 1456 terms, hence the mean was 12.13 (ranged from 4 to 23) and monolinguals mentioned 1857, and the mean for them was 15.47 (ranged from 4 to 34); hence the mean for the respondents whose mother tongue was Persian (i.e., monolinguals) was 3.3 terms more. From a psychological point of view, it is interesting to note that children (from the participants) offered the colors with some expressions like /por-rang/ (strong), /kam-rang/ (pale), /rowšan/ (light), and /tire/ (dark) for pointing the hues of those colors; adults - the university students in this study – offered new and single words for those hues. This is due to children language development, which is much slower than their cognitive development (actually, the child could distinguish the colors like an adult, or much better, but did not have any terms for some of those hues).

Table 1 presents all the color terms that the participants named first in the list. The color term, most frequently mentioned first by both bilinguals and monolinguals, was *qermez* 'red'. It was followed by *âbi* 'blue', for both. As indicated, the first five terms mentioned by monolinguals and bilinguals are the same in order, and this is the first effect of the mother tongue on BCTs. These terms are 85.8 % of the first place terms in monolinguals and 87.5 % in bilinguals, as a total. It means the BCTs will not change by the first language (which is in the same language family). This is the study's hypothesis, which will be verified in the following sections. The glosses for the terms are from *Abadis* Online Dictionary (Group Abadis), and p30-iliya weblog (Iliya).

Table1. *The First Offered Color Terms in the List Task*

Term	Gloss	Mono					Bi				
		College		School		Total	College		School		Total
		M	F	M	F		M	F	M	F	
Âbi	Blue	13	8	8	1	30	9	10	4	7	30
Qermez	Red	7	8	10	7	32	6	4	9	11	31
Sabz	Green	3	3	5	11	22	3	7	4	7	21
Siyâh	Black	-	2	-	1	3	2	2	-	-	4
Zard	Yellow	3	2	2	3	10	4	-	6	2	12
Sefid	White	3	1	4	1	9	3	5	3	-	11
Banafš	Purple	1	2	1	1	5	2	-	-	-	2
Surati	Pink	-	-	-	5	5	-	-	-	2	2
Tusi	Grey	-	-	-	-	-	-	-	1	-	1
Yâsi	Magnolia	-	1	-	-	1	-	-	-	-	-
Sormeyi	Dark Blue	-	1	-	-	1	-	-	-	-	-
|Pustpiyâzi	Floral white	-	-	-	-	-	1	-	-	-	1
Širi	Light yellow	-	-	-	-	-	-	2	-	-	2
Šarâbi	Wine	-	-	-	-	-	-	-	2	-	2
Muši	Mouse-colored	-	-	-	-	-	-	-	-	1	1
NârenjiZereški	Orange	-	-	-	-	-	-	-	1	-	1
Arqavâni	Crimson	-	1	-	-	1	-	-	-	-	-
	medium violet red	-	1	-	-	1	-	-	-	-	-

Table 2a shows the naming frequency, and mean position for color terms offered by more than 10% of participants in the list task, for each group in a single box, and table 2b shows those in total. The terms with less than 10 per cent are not in the list because the tendency is that the lower the frequency is, the term will be far from basic.

Table 2a. *Frequency and Mean Position for more than 10% (=4)*

Terms	Gloss	Mono				Bilingual			
		School		College		school		college	
		f	mp	f	mp	f	mp	f	mp
Âbi	Blue	57	4.97	60	2.795	56	3.48	57	2.48
Qermez	Red	57	3.485	59	3.27	59	2.745	58	4.08
Sabz	Green	58	3.775	57	5.055	55	3.77	56	5.44
Siyâh	Black	57	7.255	59	7.43	35	7.05	59	6.67
Zard	Yellow	53	5.47	56	5.42	41	3.935	57	5.98
Sefid	White	56	7.465	54	8.335	42	6.47	54	6.475
Banafš	Purple	53	6.575	48	6.67	33	5.895	47	7.075
Qahveyi	Brown	50	9.85	51	10.675	37	6.09	56	8.425
Nârenji	Orange	54	6.5	54	9.09	43	5.56	45	9.585
Surati	Pink	56	6.835	46	8.925	44	6.05	43	7.455
Sormeyi	Dark blue	14	13.435	35	12.27	6	5.58	23	10.625
Tusi	Dark gray	30	10.015	30	12.325	23	7.84	29	10.58
Keremi	Bisque	35	8.65	32	12.64	14	9	10	6.7
Xâkestari	Gray	10	6.35	25	10.725	0	-	30	9.705
Nili	Dodger blue	20	7.265	26	9.39	0	-	20	9.32
Noqreyi	Light gray	10	4.95	23	13.86	10	7.915	19	13.355
Yašmi	Dark green	0	-	15	13.61	0	-	15	9.58
Yâsi	Magnolia	0	-	19	11.71	0	-	12	5.75
Talâyi	Golden	37	9.14	23	15.5	7	3.64	16	12.915
Zereški	Crimson	5	6.5	12	13.685	0	-	0	-
Bež	Beige	0	-	15	15.85	0	-	6	7.915
Firuzeyi	Aqua	0	-	12	10.125	0	-	5	3.1
Fosfori	Phosphoric	0	-	10	7	0	-	0	-
Nokmedâdi	Charcoal	0	-	10	14.58	0	-	12	12.165
Arqavâni	Medium violet red	0	-	11	10.48	0	-	4	6.125
Sorxâbi	Fuchsia	0	-	14	11.325	0	-	6	6.75
Ŝiri	Light yellow	0	-	11	15.085	0	-	10	4.75
Golbehi	Salmon pink	0	-	6	6	0	-	7	6.14
Zeytuni	Olive green	0	-	6	11.58	0	-	6	7.415
Pesteyi	Green yellow	0	-	5	5.6	0	-	4	7.25
Limuyi	Lemon0colored	0	-	7	6.285	0	-	4	6
Mesi	Copper	0	-	5	7.3	0	-	0	-
Šokolâti	Chocolate	0	-	4	8	0	-	0	-
Ăbi0k	Pale blue	5	4.1	0	-	0	-	0	-
Ăbi0p	Strong blue	6	6.83	0	-	0	-	0	-
Sabz0k	Pale green	5	7.1	0	-	0	-	0	-
Lajani	Yellow green	5	5.6	0	-	0	-	0	-
Xardali	Mustard	0	-	0	-	0	-	4	6
Lâjevardi	Azure	0	-	0	-	0	-	4	5.5

Table 2b. *Frequency and Mean Position for more than 10% (=12) in total*

Terms	Gloss	Mono		Bi	
		f	mp	f	mp
Âbi	Blue	117	3.88	113	2.98
Qermez	Red	116	3.38	117	3.41
Sabz	Green	115	4.41	111	4.61
Siyâh	Black	116	7.36	94	6.77
Zard	Yellow	109	5.43	98	5.17
Sefid	White	110	7.92	96	6.50
Banafš	Purple	101	6.66	80	6.60
Qahveyi	Brown	101	10.30	93	7.49
Nârenji	Orange	108	7.75	88	7.61
Surati	Pink	102	7.72	87	6.73
Sormeyi	Dark blue	49	12.61	32	10.81
Tusi	Dark gray	60	11.13	52	9.61
Keremi	Bisque	67	10.85	27	10.85
Xâkestari	Gray	36	11.25	30	9.66
Nili	Dodger blue	46	8.08	23	8.30
Noqreyi	Light gray	35	12.88	29	11.48
Yašmi	Dark green	15	13.6	15	9.53
Yâsi	Magnolia	21	11.71	17	11.29
Talâyi	Golden	60	11.78	26	10.53
Nokmedâdi	Charcoal	-	-	13	11.61
Zereški	Crimson	19	13.15	-	-
Bež	Beige	15	15.8	-	-
Firuzeyi	Aqua	12	10.91	-	-
Fosfori	Phosphoric	13	13.38	-	-
Sorxâbi	Fuchsia	17	11.17	-	-
Golbehi	Salmon pink	12	12.16	-	-
Sabz-k	Pale green	12	11.58	-	-
Lajani	Yellow green	12	13.41	-	-

The more frequent terms, with lower mean positions are the candidates of BCTs, since the basic terms come to one's mind faster (lower mean position) and being used more frequently (higher frequency). The first ten terms in table 2b are the candidate, since more than half of the participants mentioned them in their list.

Table 3 shows all kinds of mP; the 2nd way of taking mP is by dividing position of a term (P) into the length of that list (L).

Table 3. *Three kinds of Mean Position*

Term	Gloss	mP		Mean of (P/L)		Mean of (P/L) by value	
		Mono-ling	Bi-ling	Mono-ling	Bi-ling	Mono-ling	Bi-ling
Âbi	Blue	3.88	2.98	0.2678	0.2780	12.51	10.35
Qermez	Red	3.38	3.41	0.2244	0.2929	13.33	9.74
Sabz	Green	4.41	4.61	0.3043	0.3821	12.04	8.65
Siyâh	Black	7.36	6.77	0.4919	0.5494	9.32	7.32
Zard	Yellow	5.43	5.17	0.3654	0.4176	11.18	8.68
Sefid	White	7.92	6.50	0.5192	0.5438	8.81	7.43
Banafš	Purple	6.66	6.60	0.4488	0.5392	9.86	7.32
Qahveyi	Brown	10.30	7.49	0.6581	0.5676	6.75	6.66
Nârenji	Orange	7.75	7.61	0.5168	0.6085	8.94	5.84
Surati	Pink	7.72	6.73	0.4992	0.5601	9.29	6.86
Tusi	Dark gray	11.13	9.61	0.6718	0.7134	6.66	4.98
Xâkestari	Gray	11.25	9.66	0.6861	0.6503	6.33	6.33

Since the range of the 2nd kind of mP is decimal, the graph for the 3 kinds are separated into (a, and b). In Figure 2a, the 1st and 3rd kinds are compared, which are in range more than decimal digits. Figure 2b shows the 2nd kind, which has decimal differences.

As it is presented, the 3rd kind shows more accurate understanding of mP; because in all the length of the trend in the graph, the value of mP for bilinguals is less than monolinguals and this trend is without any exception. In those 2 kinds, however, this difference must be contrariwise, i.e. the degree value of

bilinguals must be higher than monolinguals; there are 2 points of exceptions, which cannot be ignored. Therefore it is essential to mention that "value of the terms" determines mP optimally.

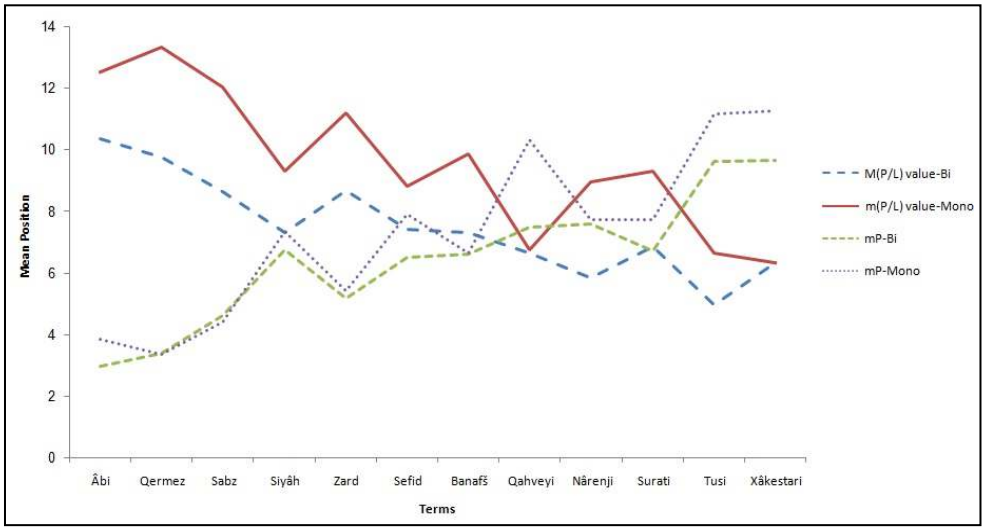

Figure 2a. ***Kinds of Mp***

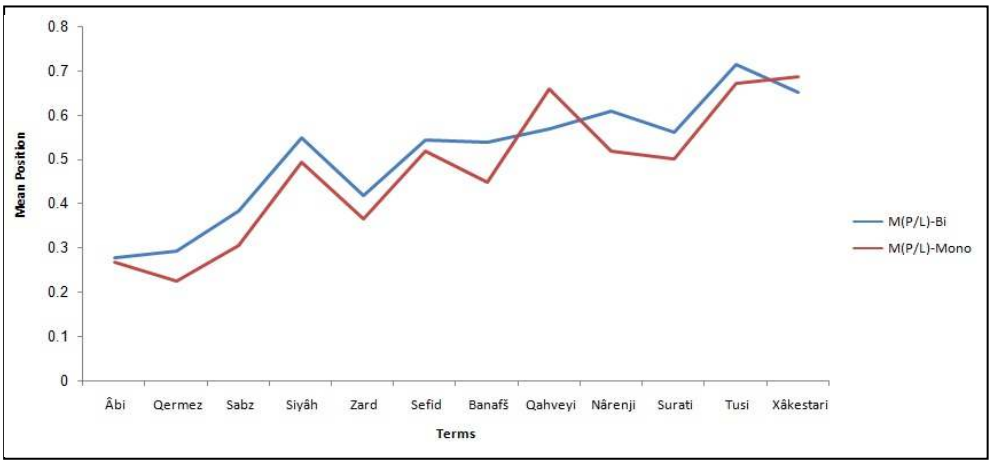

Figure 2b. ***Kinds of Mp***

Table 4 shows the saliency, based on Sutrop (2001).

Table 4. *Saliency (Sutrop, 2001)*

Term	Gloss	Saliency	
		Mono-ling	Bi-ling
Âbi	Blue	0.2512	0.3159
Qermez	Red	0.2859	0.2859
Sabz	Green	0.2173	0.2006
Siyâh	Black	0.1313	0.1157
Zard	Yellow	0.1672	0.1579
Sefid	White	0.1157	0.1230
Banafš	Purple	0.1263	0.1010
Qahveyi	Brown	0.0817	0.1034
Nârenji	Orange	0.1161	0.0963
Surati	Pink	0.1101	0.1077
Tusi	Light Gray	0.0449	0.0450
Xâkestari	Gray	0.0266	0.0258

Table 5 shows the saliency, based on the S_{mix} formula.

Table 5. *Saliency (mix).*

Term	Gloss	Saliency	
		Mono-ling	Bi-ling
Âbi	Blue	0.753	0.721
Qermez	Red	0.788	0.761
Sabz	Green	0.703	0.607
Siyâh	Black	0.538	0.322
Zard	Yellow	0.581	0.446
Sefid	White	0.461	0.352
Banafš	Purple	0.430	0.246
Qahveyi	Brown	0.289	0.303
Nârenji	Orange	0.447	0.258
Surati	Pink	0.410	0.270
Tusi	Light Gray	0.097	0.068
Xâkestari	Gray	0.033	0.026

In Figure 3, the 2 kinds of salience indices, i.e. Sutrop (2001) and mix are compared, which shows that bilinguals' degree is less than monolinguals'. In 2 points, this trend is contrariwise (those points in Figure 2) in both kinds. The mix salience's diagram shows the trend of differences of bilinguals and monolinguals' salience better in the whole route; hence the mix formula could be said as a better choice for achieving BCTs.

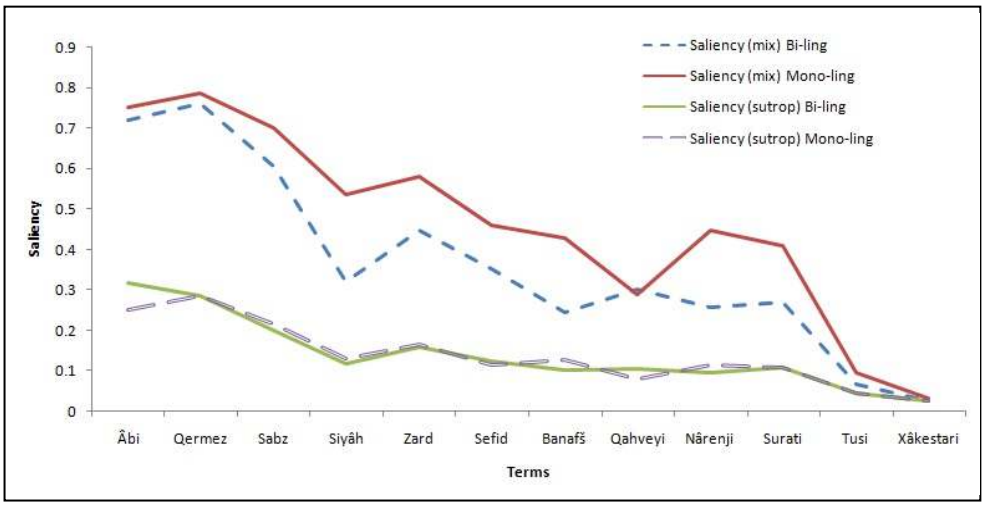

Figure 3. *Linear Chart, Comparing 2 Kinds of Salience Index*

The graphs in the study show the same thing, as the results, however the smaller degree of mean position and saliency in all the length of bilinguals' graph, comparing to monolinguals, show that bilinguals use BCTs less than monolinguals and the orders of Persian BCTs are the same for them.

In statistical analysis, there are 2 kinds of analyses: hurdle model and scale model. In hurdle model, based on having or lacking the value of any factor, a term will have + or -, respectively. At last, the values summed up to being concluded. In the 2nd model, which has two kinds of ordinal and internal, the ranks of the terms are mentioned. The models' difference is that in scale model the range of the difference of each term to another term in another rank could

be shown. For more accurate results, the 2 models are used together, in the present study.

Checking hurdle model shows that all the terms have the same values for the two groups, hence it is not mentioned here and the results of only the 2nd model is shown in Table 6.

Table 6. *Points of Terms, Based on Their Ranks*

Terms	Gloss	First		Frequency		Mean Position (value)		Saliency (mix)		Points	
		Mono	Bi	Mono	Bi	Mono	Bi	Mono	Bi	Mono	Bi
Sefid	white	7	7	7	7	3	7	6	7	23	28
Siyâh	black	4	6	10	6	6	6	7	6	27	24
qermez	red	11	11	10	11	11	10	11	11	43	43
Sabz	green	9	9	8	9	9	8	9	9	35	35
Zard	yellow	8	8	6	8	8	9	8	8	30	33
Âbi	blue	10	10	11	10	10	11	10	10	41	41
Qahveyi	brown	0	0	3	5	2	3	2	5	7	13
nârenji	orange	0	3	5	4	4	1	5	3	14	11
surati	pink	6	5	4	3	5	4	3	4	18	16
Banafš	purple	6	5	3	2	7	6	4	2	20	15
xâkestari	gray	0	0	1	1	1	2	1	1	3	4

Entirely, Table 7 shows the hierarchy of the 2 monolinguals and bilinguals color terms in Persian. It is indicated that the order of basic color terms are the same for the 2 groups, but the order of non-basic color terms are not the same. In Persian BCTs, the difference of the exception terms (Siyâh and Sefid) is much lower than the difference between non-basic terms (Banafš, Surati, Nârenji, Qahveyi).

Table 7. *Persian BCT for Two Groups of Persian Speakers*

Monolingual		Bilingual	
Gloss	**Term**	**Term**	**Gloss**
red	Qermez	Qermez	red
blue	Âbi	Âbi	blue
green	Sabz	Sabz	green
yellow	Zard	Zard	yellow
black	Siyâh	Sefid	white
white	Sefid	Siyâh	black
purple	Banafš	Surati	pink
pink	Surati	Banafš	purple
orange	Nârenji	Qahveyi	brown
brown	Qahveyi	Nârenji	orange
gray	Xâkestari	Xâkestari	gray

3. Discussion

As the first hypothesis, it was assumed that bilingualism could not change the BCTs order in second language. Our findings showed that the BCTs order is not affected by bilingualism, i.e. the BCTs for Persian monolinguals and bilinguals remain similar. The pattern and the number of the mentioned color terms for university bilingual students was very similar to the university monolinguals, but the bilingual school students (which were encountered to Persian less than two years) mentioned the BCTs in different order and with different mean rank and frequency (it is much similar to a monolingual Kurdish) (See table 2a). The findings are in line with Athanasopoulos (2007 and 2006) and Athanasopoulos and Kasai (2008) who found that increasing proficiency in the L2 was the best predictor of the degree to which Japanese–English bilinguals shifted their similarity judgments of countable objects and

non-countable substances towards those of monolingual speakers of English. Increasing proficiency and the second language encounter time are two factors which affect the bilinguals' behavior and derive them to behave more like monolinguals. In other words the university bilingual students, who showed the same pattern as monolingual university students, used L2 much more than bilingual school students, who used L2 for about 4-5 hours a day.

As the second hypothesis, it was assumed that the old usual method for obtaining mean position (Sutrop 2001: mP=mean of position as a whole), and dividing position of a term (P) into the length of that list (L) (mP=P/L) and the method for obtaining saliency (Sutrop 2001: $S = F/(N\,mP)$ would not determine the BCTs in Persian. For mP we proposed this formula: mP_{mix} ((P/L) by value)=(L+1)-P; and for saliency this one: $S_{mix}=F/N \sum((L-R)+1)/L$. As it is presented in (Fig 2 a & b), by using the mP_{mix}, we were able to show more accurate understanding of mP; since it is known that the mP of bilinguals must be lower than monolinguals'. It was clear that in all the length of the trend in the graph, the value of mP for bilinguals is less than monolinguals and this trend is without any exception.

4. Conclusion

We attempted to obtain the relation between linguistic relativity hypothesis (in case of BCT) and bilingualism. The results of comparative studies in monolingual and bilingual Persian speakers showed that Persian BCTs are /Qermez/ (red), /Âbi/ (blue), /Sabz/ (green), /Zard/ (yellow), /Siyâh/ (black), and /Sefid/ (white), respectively. The BCTs and their ordering are the same in two groups, (for Siyâh and Sefid there is a small exception). The BCTs are retrieved by monolinguals much faster than bilinguals (based on bigger frequency and saliency and smaller mean position). Mean Position and

frequency in school and university students had differences in number supporting the hypothesis that staying for more than two years in a bilingual environment and L2 use frequency are the two effective factors in BCTs order.

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