STUDIA UNIVERSITATIS BABEŞ-BOLYAI BIOLOGIA, 64, 2, 2019 (p. 13-24)
doi:10.24193/subbbiol.2019.2.02

# The relation between natural and sexual selection – study case on the phenotypic characteristics that influence mate choice in a North-West Romanian human population

Sînziana Alexandra Popa-Cordun[1]✉, Alexandru N. Stermin[1]

[1]*Babeş-Bolyai University, Department of Taxonomy and Ecology, Faculty of Biology and Geology, 5 – 7 Clinicilor Str., 400006, Cluj-Napoca, Romania;*
✉***Corresponding author, E-mail: popacsinziana@gmail.com.***

**Abstract.** The force of sexual selection acts upon the mating process of all beings, this great force is influenced by different factors as phenotypic characteristics. Related to mate choice, in humans, recent studies have shown that, along with eye color, hair color is considered a relevant physical trait (Frost, 2006). Thereby, the purpose of this study is to reveal how these two factors influence mate choice by analyzing the hair color preference of a small population from Romania. Additionally, we explore how different types of selection influence each other and assume that both contribute in choosing a partner. In order to obtain basic data, a socio-demographic survey was addressed to adult male and female individuals. Based on their answers, disregarding the gender, a considerable number of individuals are brown-haired, as we expected from this area of the globe. Among the results obtained, the following considerations are worth mentioning: the most common hair color in Romania is brown, individuals with this trait are considered the most attractive for the opposite sex and parents' hair color represents a predictor for future partners. These preferences are both in concordance and in contrast with natural selection. However, much more research is needed, approaching other areas such as genetics and forensics to determine how all these mechanisms, as well as others, affect the process of mating.

**Keywords:** clinal variation, hair color, parental imprinting.

## Introduction

Evolution is influenced by both sexual and non-sexual interactions of certain physical traits (Janif *et al*., 2014; Zinnia *et al*., 2015). Even so, individuals' secondary characteristics are the basis for any type of selection and their evolution has an essential role in the survival of the species (Darwin, 1874).

When it comes to a partner, since Darwin's first observations, from insects to humans, all have a preferential behavior, related to sexual selection (Darwin, 1874). For example, a whole group of males will be in a competition to create ideal conditions, according to the requirements and expectations of the females. The male's goal and all his intense work comes from the ambition to pass its genes to the next generation. It has also been noticed that, if males compete for areas rich in food, females may develop a certain affinity for this type of males with wide territories and rich in resources (Buss, 2006).

In nature, fighting and defending have the role of generating food, territory and continuity of generations. Thanks to these behaviors, besides better preserved individuals in the population, organisms with small variations of characteristics also appear, which increases the chance of personal safety, reproduction and evolution, as a result of cumulative natural selection over time. Even changes in texture or color of the skin, fur, plumage or hair can affect their safety and bring changes in behavioral development. As a result of new varieties in species, the predecessors less adapted to the existing living conditions are gradually replaced. A certain variation, more or less different from the wild form creates a slow and balanced evolution restricted by environmental conditions required for survival. Selective pressures act upon organisms in an unfavorable manner, as long as they do not adapt to the conditions imposed by the environment in which they live (Darwin *et al*., 1930; Lyon and Montgomerie, 2012).

Recently, types of selection should not be classified or isolated into two different categories, sexual or natural selection. They intertwine and have the same end-purpose: the continuity of species (Lyon and Montgomerie, 2012). As we know so far, the process of choosing a partner is complex, determined by phenotypic characteristics, some influenced by parental imprinting and framed in a varied clinal range.

Parental imprinting phenomenon explains individuals' preferences and affects, to some extent, sexual selection, based on the early distinction of parental traits. It has two complementary forms of manifestation, a positive one and a negative one. First category includes a form of sexual selection, based on the correlation of phenotypic characteristics, valid for both sexes, that exist between the two partners or between the individual's partner and parents and explained by familiarity formed in early years of life. Wilson and Barrett determined that the similarities between the eyes of a daughter's partner and the eyes of her father are not at all accidental, while the resemblances with the mother's eyes are insignificant (Wilson and Barrett, 1987). Negative imprinting is in opposition to the first model, so the individual is rejecting a potential mate with physical traits which are similar to his parents. This repulsion is also

developing towards other individuals encountered in the first part of their life, such as siblings. Although at first it was thought so, research results do not demonstrate the existence of sexual aversion for the same-sex parent physical qualities (Westmarck, 2000; Little *et al*., 2003). None of these two types of imprinting abolish each other, but, on the contrary, each one has a well-established evolutionary role and influence how sexual selection acts upon individuals. The attractiveness of parents' general features determines the transmission of genes to the next generation, while the rejection is an intuitive behavior in order to avoid an inappropriate pairing, that leads to genetic and evolutionary imbalances (Bateson, 1980, Little *et al*., 2003).

Clinal variation refers to the geographical position, more precisely the latitude, which forms a variety of phenotypical characteristics observed in hair, eyes and skin color. It is an evolutionary process which has the role of modeling sexual selection by changing the way that parental imprinting works. All these modifications are maintained on a genetic level, along generations, until nowadays. In humans, latitude creates a globally chromatic diversity. Around the Equator, the color of the skin, and both eyes and hair are darker and become brighter as we reach the poles. This phenotypic variability began in Ancestral Europe, when modern humans left Africa. More severe climate and low temperatures have led to a decrease in melanin and vitamin D synthesis followed by brightening of skin, eye and hair color. All of these changes are happening in order to adapt to low UV radiation (Darwin *et al*., 1930; Parra, 2007; Vaughn *et al*., 2008; Frost, 2014). Hence, the preferences related to this phenotypic marker are differently expressed spatially and geographically, and depend to some extent on the socio-cultural factors (Ayton, 2005).

Finally, aspirations for certain qualities in a partner, with respect for sexual selection, create an evolutionary revolution by increasing the frequency of a desired quality and/or decreasing an unwanted characteristic. Ultimately, this phenomenon leads to an evolution of genetic diversity and diminishes the effects caused by the cline (Janif *et al*., 2014).

In this context, this study evaluates the percentage of the population from North-West part of Romania with relevant characteristics for the biogeographical area in which they are located. We also evaluate the number of volunteers in which parental imprinting determines preferences for the companion. Moreover, preferences for partners with different hair pigmentation have been exploited and analyzed. These preferences, belonging to sexual selection, are within the range of clinal variation. Last but not least, it has been attempted to explain a situation where sexual selection determines a compatible behavior or attitude, in contrast with the clinal variation belonging to natural selection.

In order to accomplish this, participants answered questions about their hair color, both parents and current partners hair colors and they also were given the possibility to choose from relevant pictures, illustrating individuals of each gender with different phenotypical characteristics.

## Materials and methods

During October 2017 until February 2018, 107 volunteers, randomly chosen, 57 women and 50 men, aged 45 to 78 from Cluj-Napoca city of Romania participated in this study. The volunteers were part of a socio-demographic survey synthetically presented in Fig. 1. Initially, according to the participants' answers, we evaluate sex and age of each subjects. In the next step, four photos were presented (Tab. 1 and Fig. 1), two for each gender, which illustrate two women with opposite facial features: one of them with dark hair and brown eyes, and the other one blonde with blue eyes. Male photos were chosen following the same pattern. In order to make the interpretation of the data easier, each picture was marked by a letter: dark-featured female (A), light-featured female (B), dark-featured male (C) and light-featured male (D). Each participant was asked to choose the favorite photograph, males chose between A and B, and females between C and D, then to classify how attractive the chosen individual is, on a scale from 1 (I do not like it) to 7 (I really like it). Following, four questions were addressed, in order to find out the natural hair color of the subject, of both parents and the current partner. Descriptions of hair shades have been restricted for statistical reasons to four types of hair color: brown, black, blond and red.

**Table 1.** Survey format

| |
|---|
| Name initials: _____ |
| Sex: M F |
| Age: _____ |
| Which individual presented do you preffer? (A, B, C or D) |
| How much do you like her/him? (1 2 3 4 5 6 7) |
| |
| 1.Natural hair color of your mother is: |
| 2.Natural hair color of your father is: _____ |
| 3.Your natural hair color is: _____ |
| 4. Do you have a partner? If yes – natural hair color of your partner is: |

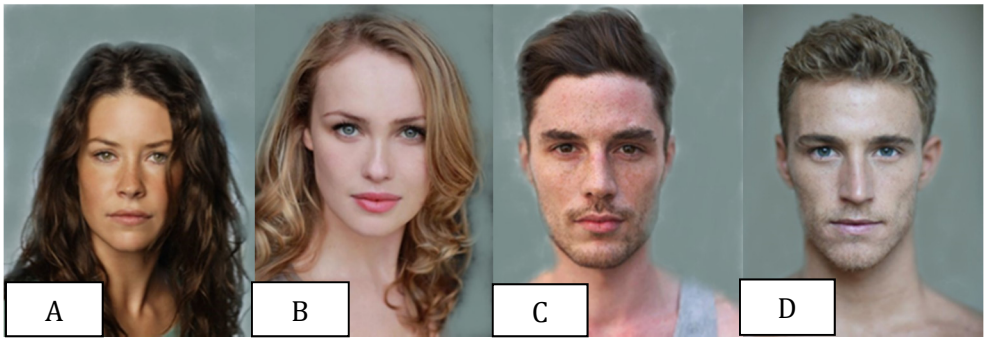


**Figure 1**. Survey questions and image options for men (A or B) and women (C or D)

## Results

Analyzing the frequency in which these four hair shades appear in the studied population, we observe that 69 of the volunteers present brown hair, 28 black hair, 9 blonde hair and 1 person with red hair (Fig. 2). Regarding their family history, from a total number of 214 mothers and fathers, participants claimed 118 parents, with brown hair, preceded by 70 black-haired parents, 21 blondes and just 1 mother with red hair. The rest of 4 remain non-declared and statistically irrelevant (Fig. 3).

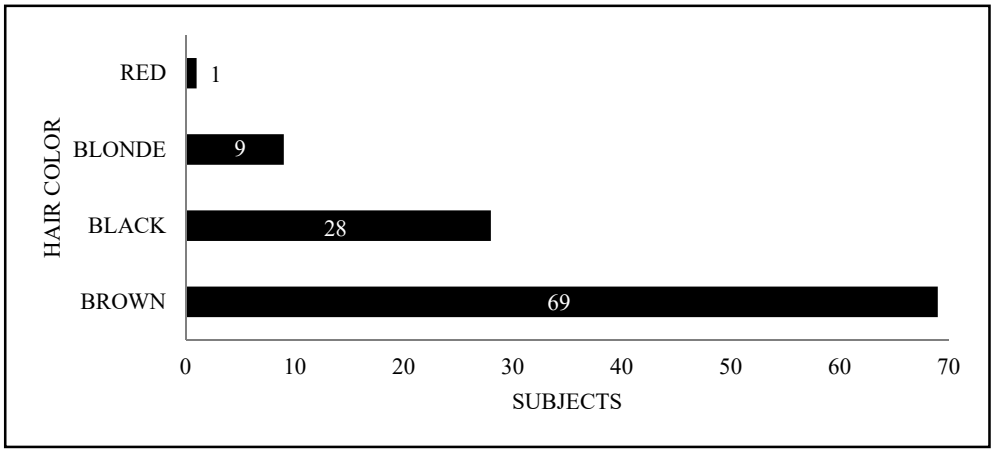


**Figure 2**. The total number of subjects and their hair color

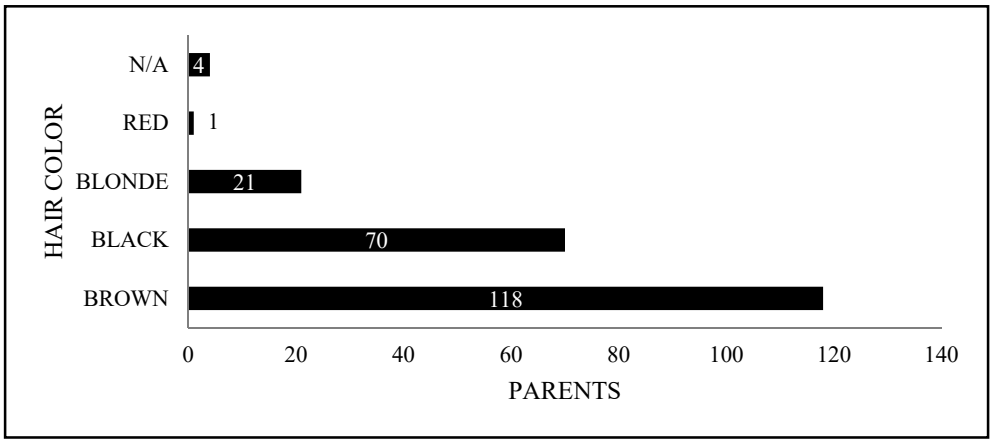


**Figure 3**. The total number of parents and their hair color

Regarding current romantic relationship situations, both women and men regularly declared partners who also present brown hair - 54 out of 107. The frequency of partners with black hair is also high and appears in 31 cases, followed by 10 blonde mates and another 1 red-haired (Fig. 4).

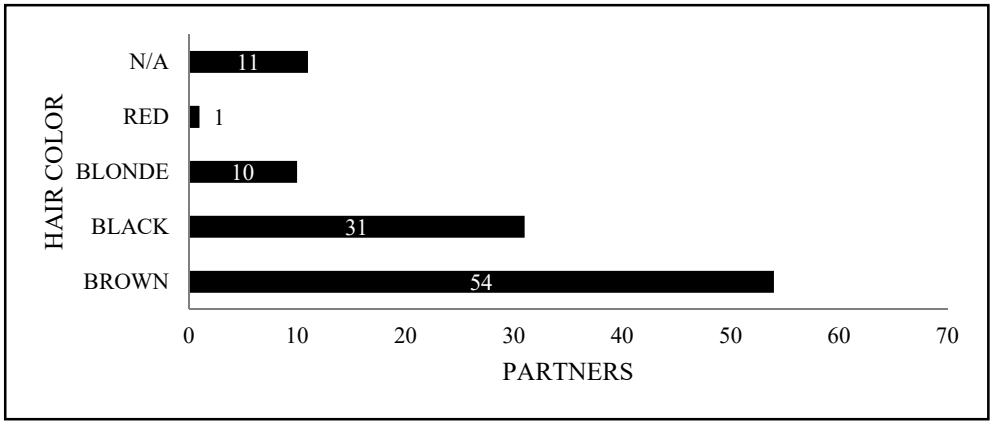


**Figure 4**. The total number of partners and their hair color

By comparing the results obtained from hair color analysis of parents and partners, we evaluated the chance that partners have similar hair shade as the same-sex and opposite-sex parent. Hence, for male volunteers, from a total of 50 possible cases, 45 of their partners have the same hair color as their mothers

and 42 correlations between the shade of the partners and fathers have been found (Fig. 5). When it comes to female subjects, from a total of 57 situations, 44 of them present similar hair color among partners and opposite-sex parents and rest of the 43 cases display partner's hair color correspondent with the same-sex parent's hair color (Fig. 6).

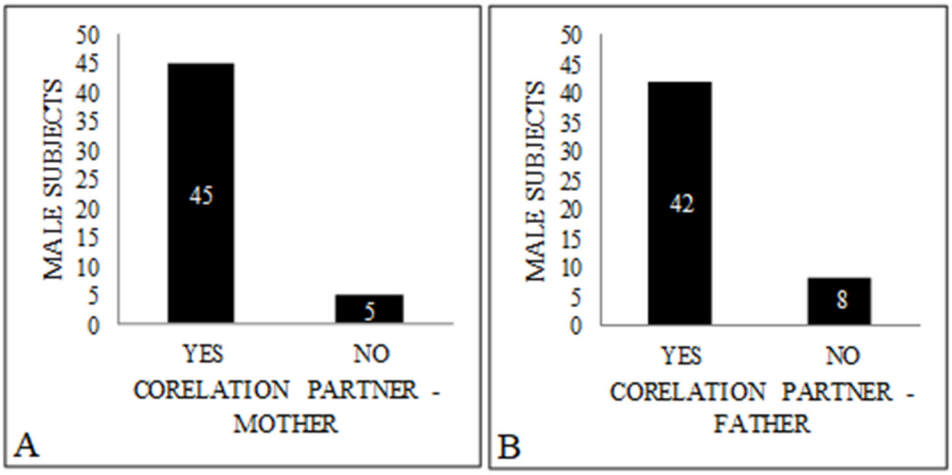


**Figure 5.** The number of male subjects who chose a partner with the same hair color as their opposite-sex parent (A) and as their same-sex parent (B)

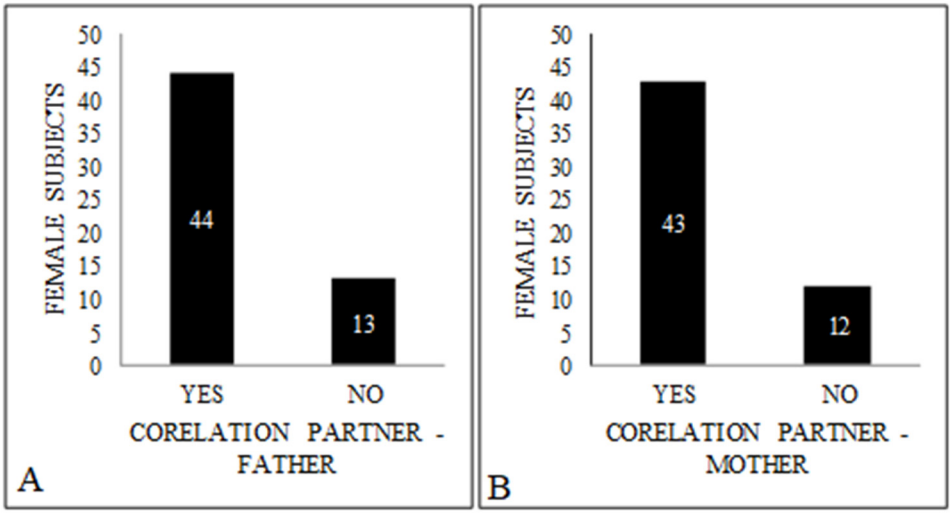


**Figure 6**. The number of female subjects who chose a partner with the same hair color as their opposite-sex parent (A) and as their same-sex parent (B)

In terms of choosing the favorite photograph, results indicate that 28 men preferred the one illustrating the female with dark facial features (A) and the rest of 22 chose the picture with the light facial features (B). Concerning the opposite gender, 33 females preferred the image with the brunette man (C) against the 24 who selected the blonde one (B) (Fig. 7).

When volunteers were asked about their own hair color preferences, 31 women indicate a different hair color than natural (Fig. 8). Furthermore, reports of male subjects suggest that 4 of them did not have a current partner. In the rest of the cases, 14 male volunteers declare that their partner dyed their hair in the same color as natural and 17 changed their hair color after dyeing (Fig. 9).

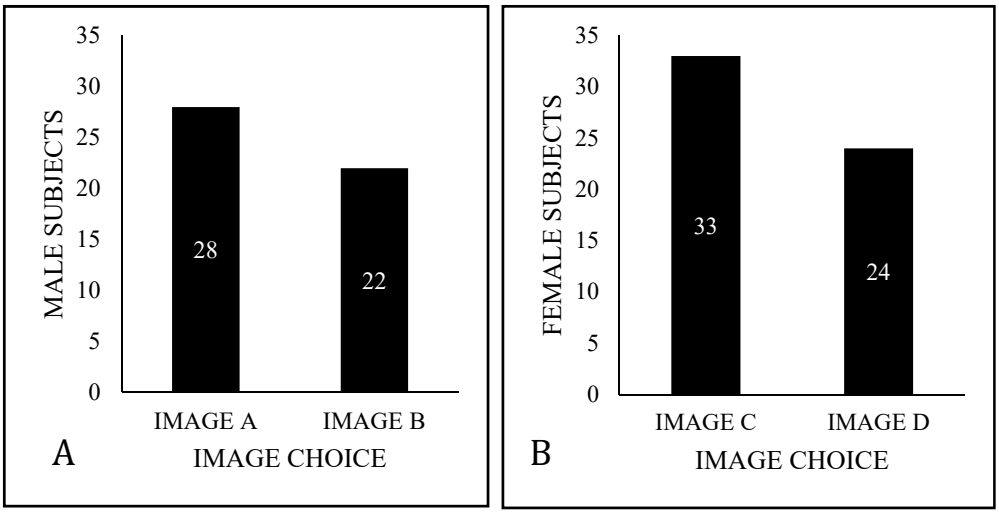


**Figure 7.** The number of male (A) and female (B) subjects and their image preference

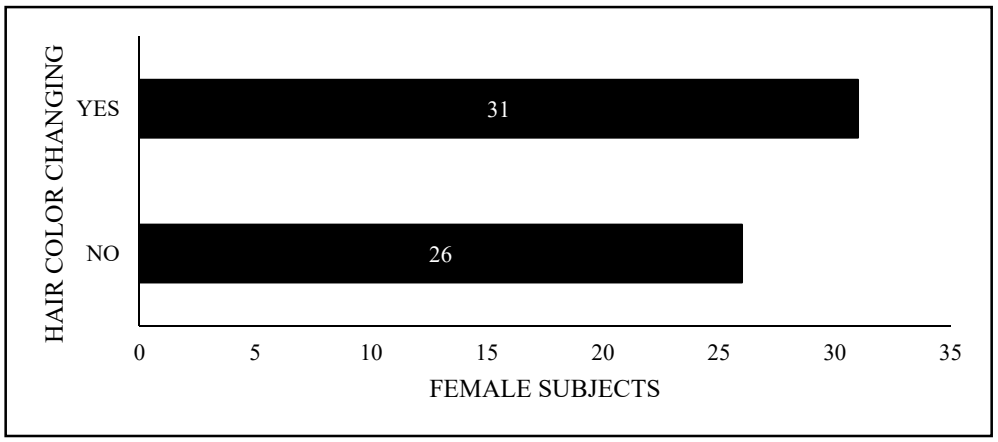


**Figure 8**. The number of females who would and would not prefer another hair color than natural

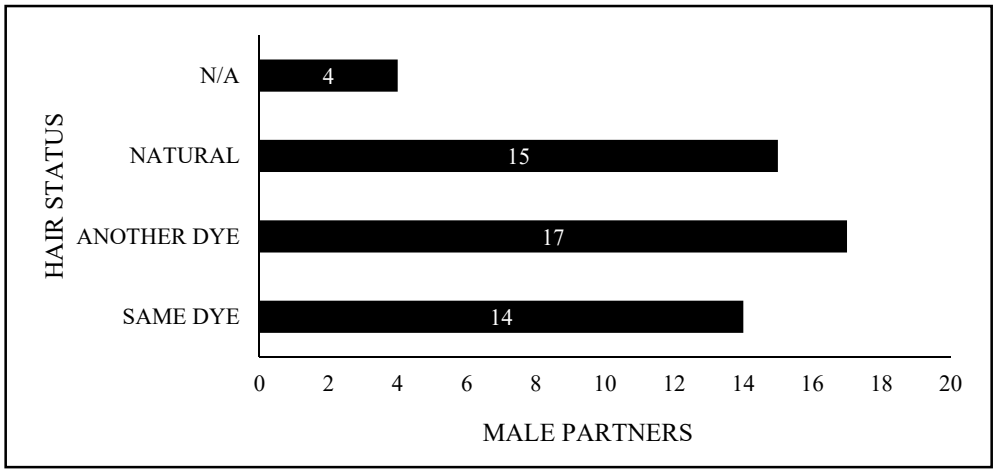


**Figure 9**. The number of male partners and their hair status (natural or dyed)

## Discussion

Based on the survey data, it was found that most of the subjects who participated in the study had dark hair, especially brown (Fig. 2). Statements provided by male and female subjects show another high frequency of dark hair in parents and the lowest proportion of blond-haired (Fig. 3). This may be the

result of the higher proportion of people with generally intermediate darker color traits such as brown eyes and hair and intermediate light skin living in this region. Also, possible influences of latitude can create an environmental diversity in human population (Janif *et al*., 2014). All these outcomes indicate that geographic positioning on the globe and cline could be determinant for eye and hair color (Darwin *et al*., 1930; Ayton, 2005; Shekar *et al*., 2008; Frost, 2014). In Romania, too, this may sustain the clinal variation process.

Some specialists have thoroughly studied the importance of hair color in particular cases like choosing a partner, and the link between it and the attractiveness of an individual. It was discovered that most people from a total of eight different cultures, considered dark hair individuals more attractive (Ayton, 2005).

The similitudes between the partner and the parent of the opposite sex have also been discussed, in terms of eye and hair color which are generally valid (Little *et al*., 2003). Recent studies consider the opposite parent's hair pigmentation a considerable predictor in choosing a partner, in humans, not excluding the positive effect of the same-sex parent's hair coloration (Westmarck, 2000). Wilson and Barret demonstrated before that eye color of the opposite-sex parent create a model of the offspring' partner. Because of the correlation between eye and hair color, we expected to see an increased similarity among the features of partners and the opposite-sex parents. Moreover, we explore trough this study that the color of the same-sex parent hair has an implication for choosing a partner, too (Wilson and Barrett, 1987). In almost all cases, regardless of gender, hair color similarities are obvious between both parents and partners (Figs. 5 and 6).

So, it can be said that parental imprinting has a significant role in mate choice and represents an adaptation strategy, in which the individual becomes marked by the general physical features of the parent with whom he grew up. So, we can agree with the statement that the opposite parent's hair pigmentation, one of the most important feature in choosing a partner (Little, *et al*., 2003), can be also considered in North-West part of Romania.

Moreover, all 107 statements and image choices affirm that both clinal variation and parental imprinting influence the favoritism for dark features in studied population due to the performed analogy between the favored image and the natural color of volunteers' partners. It can be noticed that, despite of the image choice, there is a predominance of brown-haired partners (Figs. 4 and 7).

Apart from the fact that there is a higher percentage of people with dark hair, there is also a preference for this phenotypic characteristic in Romania. This was based on the results obtained, namely the recurrence of brown hair in volunteer responses about their life partners. Considering all of this, it can be

said that natural selection (existing hair, eye and skin color) overlaps the sexual selection (the preference for a certain hair, eye and skin color) and that the distinction between these two cannot be made. Both are part of one and the same type of selection, that encompasses them all.

Besides the fact that these two types of selection sum up a whole, they also influence each other. That can be the reason why even the female volunteers with blonde fathers favor a brown-haired partner. An interesting result can be observed in women who did not declare the color of their father's natural hair, but they chose exclusively black-haired partners.

The desire for transformation is more visible in women than men (Fig. 8). Alternatives proposed, in terms of hair colors, were red, violet, gray, and different shades of brown, black and blonde. The results also indicate that, most women would prefer red hair, the most rare natural hair color worldwide. Withal, a large number of the interrogated male's partners have their hair dyed (Fig. 9). Related to men's desire to have a different hair color than natural, the results are in opposition to female volunteers.

These results can demonstrate that observations made by Schweder, stating that the action of changing the natural hair color comes from the female desire to be different and intuitively attract males, behavior existing since Homo sapiens left Africa and faced the consequences of the Ice Age. This is confirmed by the hypothesis regarding the preference of novelty and rare characteristics in a population (Schweder, 1994; Frost, 2006; Frost, 2014; Zinnia *et al*., 2015).

## Conclusions

Most attractive partners for humans in Romania, studied until now, present dark features and physical appearance of the parents, which is the most important pattern for all human individuals, in terms of mate choice. This topic of major interest in biology, as well as other areas such as sociology, psychology or demography is still in a phase of ongoing debate and differing views since its original theorization given by Charles Darwin and deserves future statistical study and interventions.

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