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Study on Diversity in Some Human Phenotypic Characteristics

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Abstract. The present study aimed to analyze the human phenotypic manifestation of AB0 and Rh blood groups, descriptive features cleft in chin, freckles, hairline, eyebrow shape, dimples, earlobes and the basic characteristics of personality extraversion, agreeableness, consciousness, emotional stability and intellect/imagination and the possible relations between them. About 950 individuals were included in the study. The frequencies of the investigated phenotypic groups were calculated by usage of descriptive statistics. The results obtained were analyzed by SPSS software. Statistically significant relationships were found between some of the studied human immunological, descriptive and behavior features as follows: lower levels of emotional stability in people with Rh+ blood groups ($P<0.05$); higher levels of agreeableness and consciousness in people without cleft in chin ($P=0.003$, $P=0.001$) and in persons with separeted eyebrows ($P=0.03$, $P=0.008$); higher levels of emotional stability in people with straight line of hair ($P<0.05$); higher levels of consciousness in people without dimples and higher levels of intellect/imagination in people with dimples ($P<0.05$); higher levels of agreeableness and intellect/imagination in people with a free ear lobe ($P=0.004$, $P=0.02$). No statistically significant differences were detected between blood groups of the AB0 system and the presence of freckles on the face from one side and the mean values of the personality characteristics by the other hand. The present study reveals interesting relationships between various human traits based on a complex approach. It could be used as an appropriate model for other future studies of human phenotypic diversity.

Key words: phenotypic variability, blood groups AB0 and Rh, human descriptive traits, human personality traits.

Introduction

Human genetics studies the heredity and variability which are characteristic of *Homo sapiens*. The subject of studies is a variety of human traits that are under the control of individual genes or are the result of complex interactions of genotype and environment (Mitkovska et al., 2019; Dzhoglov et al., 2021; Ivanova et al., 2021). The attention of scientists is focused mainly on the so-called pathological heredity and the studies dedicated to the inheritance of normal traits in human populations are less (Alexandrov, 2010; Ivanova et al., 2001; 2011). This interest can be explained by the growing role of medical genetics and its importance to the well-being of humanity. The human phenotypic diversity is the subject of studies for human population and formal genetics. The relationships between different, mainly monogenic, traits, and the more complicated phenotypic characteristics of the human personality are of particular interest to the researchers of the human behavior. This is the reason why the relations between well-studied components of the genetic constitution and significant phenotypic behavioral features are increasingly at the heart of interdisciplinary research (Borinskaya & Rogaev, 2000; Hill et al., 2002; Baker, 2004; Luchinin, 2005; Malykh et al., 2008; Alexandrov, 2010, etc.). From the psychology point of view, the basic characteristics of the personality, the approaches for their characterization and their frequency of manifestation in different human populations have been studied by a number of authors (McCrae & John, 1992; Pervin & John, 2001; Goldberg, 1990; 1992; 2001; Costa & McCrae, 1992a; b; 2008; Goldberg et al., 2006; Alexandrova-Karamanova, 2016; Magyar et al., 2017). Although there are data in the literature on some studies on candidate genes or descriptive characteristics in humans that could be associated with individual behavioral characteristics (Reedy et al., 1971; Wiedemann, 1990; Reiss, 1999; Bastiaens et al., 2001; Thibaut et al., 2005; Medland et al., 2009; Adhikari et al., 2016; Zaidi et al., 2018), in Bulgaria similar interdisciplinary research has hardly been done

(Ivanova et al., 2018a; b). This fact motivates the purpose of the present study: 1) to characterize the found phenotypic diversity in the group of participants in terms of some immunological, descriptive and behavior traits and 2) to look at possible relationships between them.

Material and Methods

Totally 945 individuals were studied in order to characterize the phenotypic diversity in the frequency of the human AB0 and Rh blood groups, some descriptive features and the basic characteristics of personality, as well as the possible relations between them. The persons included in the study (70.9% women and 29.1% men) were between 16 and 90 years old with average age 32.3 years. AB0 and Rh blood groups were reported by the participants themselves after having conclusions from a clinical laboratory. Using a self-reported questionnaire, data were collected about the following descriptive features: cleft in chin; freckles; hairline; eyebrow shape; dimples and earlobes. The basic characteristics of personality - extraversion, agreeableness, conscientiousness, emotional stability and intellect/imagination - were studied through the Goldberg's "Big-Five factor markers, International Personality Item Pool - IPIP" questionnaire (Goldberg, 2001, http://ipip.ori.org/), adapted for the Bulgarian culture (Alexandrova-Karamanova, 2016).

Data were analyzed through the IBM SPSS Statistics software package, version 22.0. Descriptive statistics analyses (frequencies, crosstabs) and the independent samples t-test were used.

Results

Concerning the AB0 blood groups' system, the results of our study showed that: 30.5% of the participants were with 0; 37% - with A; 18.7% - with B and 13.8% - with AB blood groups.

As for the Rh blood groups, the data show that 79.6% of the persons included in the study have Rh+ and 20.4% - Rh- factor (Fig. 1).

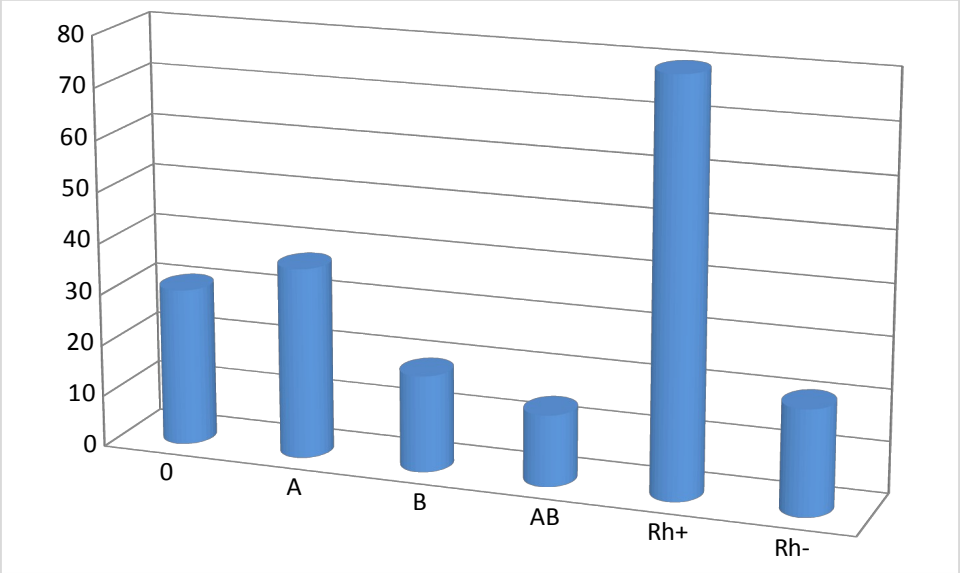

Fig. 1. Distribution of the AB0 and Rh blood groups within the studied individuals.

The data about the studied descriptive characteristics (cleft in chin, freckles, hairline, eyebrow shape, dimples, earlobes) and their frequencies in % is presented in Fig. 2. As could be seen from

the figure, the absence of cleft in chin (82.2%), freckles (85%), widow peak (64%) and dimples (64.1%), as well as the presence of separated eyebrows (88.9%) and free earlobes (71.8%) were with higher frequencies among the compared features pairs.

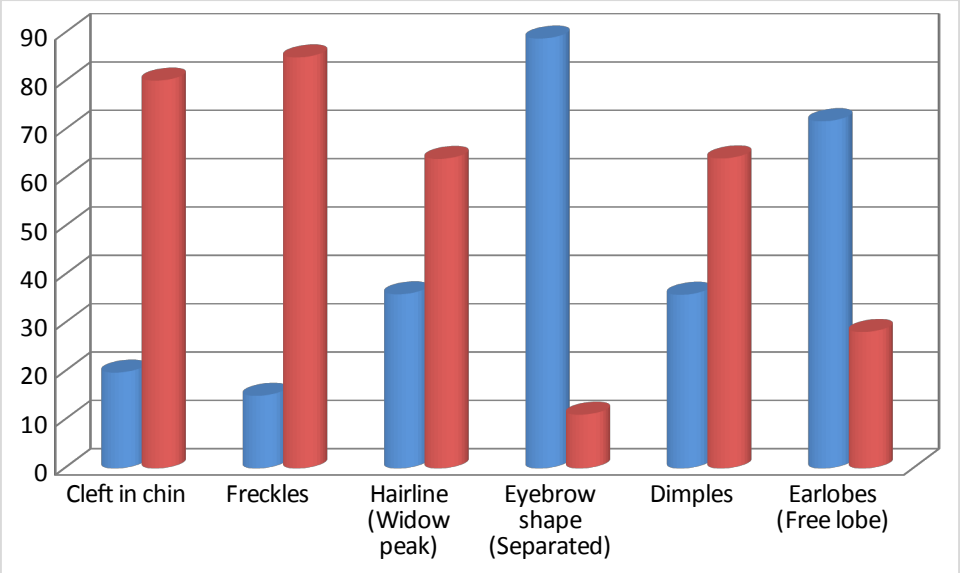

Fig. 2. Distribution (in %) of the studied descriptive characteristics cleft in chin, freckles, hairline, eyebrow shape, dimples, earlobes.

The Big-five personality traits' scales range from a minimum of 10 to a maximum 50 (Table 1). The mean values (M) found in our study concerning the extraversion, agreeableness, conscientiousness, emotional stability and intellect/imagination were as follows: 32.98 (SD=7.91); 40.25 (SD=6.35); 37.99 (SD=7.11); 29.15 (SD=9.17) and 37.58 (SD=6.35), respectively. According to the data obtained, agreeableness was most and emotional stability - lest pronounced (M=29.15) - Table 1.

Table 1. Number of individuals (N), minimum, maximum and mean values found concerning the studied personality traits.

		Extraversion	Agreeable-ness	Conscientio-usness	Emotional stability	Intellect/ Imagination
N	Valid	915	918	914	910	909
	Missing	30	27	31	35	36
Mean		32.98	40.25	37.99	29.15	37.58
Median		33.00	41.00	39.00	29.00	38.00
Mode		32	39	39	31	35
Std. Deviation		7.906	6.351	7.108	9.166	6.353
Minimum		10	11	15	10	10
Maximum		50	50	50	50	50

Also, individual results were classified into five groups (Fig. 3): individuals with low, somewhat low, average, somewhat high, and high expression of the respective personality trait. As could be seen from the figure, 45.2% of the participants in the study were agreeable (or somewhat agreeable); 64.1%

were conscientious (or somewhat conscious); 44.3% had high or somewhat high intellect/imagination; 21.4% were (somewhat) extraverted and 33.0% were (somewhat) emotionally stable (Fig. 3).

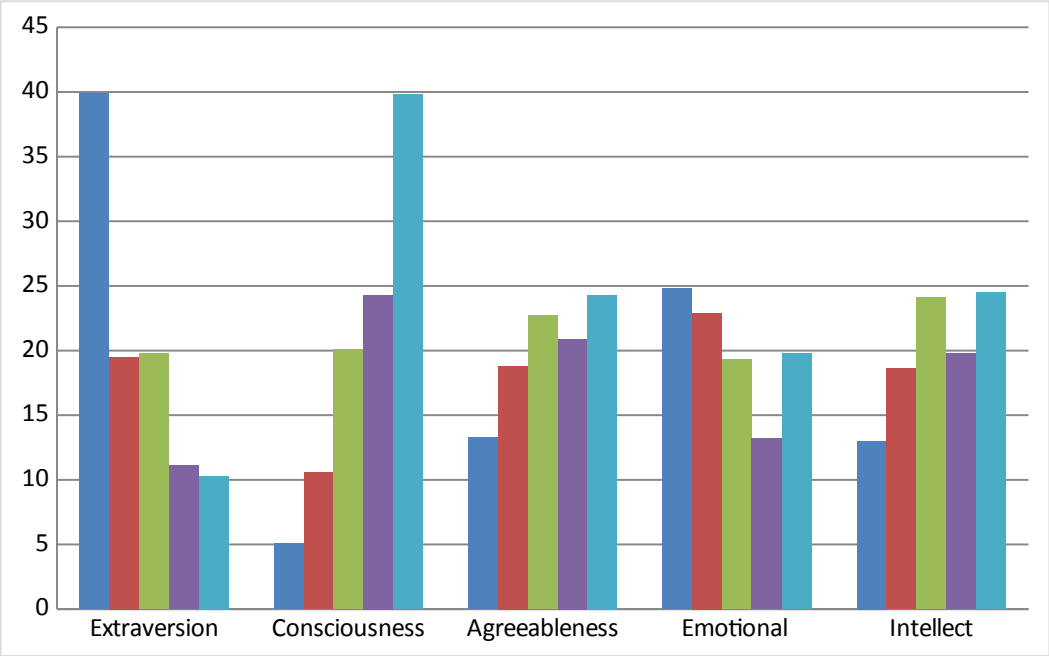

Fig. 3. Level of expression (% - valid percent) of the personality factors in the studied sample.

Statistically significant variations in the mean values of the personality factors studied were observed in relation to six of the studied traits, as follows: Rh factor - emotional stability; cleft in chin – agreeableness and consciousness; hairline - emotional stability; eyebrow shape - agreeableness and consciousness; dimples - consciousness and intellect/imagination; earlobes – agreeableness and intellect/imagination (Table 2).

Discussion

Phenotypic variations that occur in humans are a result of the gene expression, the complicated interactions between different genes and interactions between the genotype and environment.

The complexity of the relationships between many factors that have significant value for the expression of a particular phenotypic spectrum of immunological, descriptive and behavioral characteristics in humans is obvious. Investigations of their nature and mechanisms for their implementation would be useful in studying the phenotypic diversity in human populations and in the characterizing their anthropological and genetic profile.

From a clinical perspective, the AB0 is the most important blood groups antigen system. The results obtained in our study support and complement the pre-existing knowledge about the distribution of AB0 blood system among the Bulgarian population (Ivanova et al., 2001; Popov et al. 2012). Concerning the relationships with the studied personality factors, there were not found statistically significant relations in the present study between their mean values and the blood groups 0, A, B or AB. In contrast, data of our study showed lower levels of emotional stability in people with a positive Rh factor ($P<0.048$) – Fig. 1, Table 2.

The frequency of manifestation of the descriptive characteristics gives the information about the spectrum of the phenotypic diversity among the studied individuals. The available data show that most of the participants do not have as distinctive features cleft in chin, freckles, widow peak,

dimples, joined eyebrows and attached ear lobe (Fig. 2).

Table 2. Statistical associations between the human AB0 and Rh blood groups, the studied descriptive characteristics, and the Big-five personality factors.

Features studied	Personality trait	Type of manifestation	N	Mean	t (P)
Rh blood group	Emotional stability	Rh+	434	28.77	-1.983 (0.048)
		Rh-	110	30.65	
Cleft in chin	Agreeableness	Presence	174	38.98	-2.968 (0.003)
		Absence	709	40.58	
	Consciousness	Presence	176	36.49	-3.306 (0.001)
		Absence	704	38.34	
Hairline (Widow peak)	Emotional stability	Presence	316	28.25	-1.977 (0.048)
		Absence	566	29.51	
Eyebrow shape	Agreeableness	Separated	802	40.40	2.121 (0.034)
		Joined	99	38.96	
	Consciousness	Separated	795	38.16	2.657 (0.008)
		Joined	102	36.18	
Dimples	Consciousness	Presence	326	37.37	-1.991 (0.047)
		Absence	579	38.35	
	Intellect/ Imagination	Presence	321	38.18	2.044 (0.041)
		Absence	582	37.28	
Earlobes (Free lobe)	Agreeableness	Presence	641	40.61	2.887 (0.004)
		Absence	249	39.25	
	Intellect/ Imagination	Presence	643	37.86	2.312 (0.021)
		Absence	242	36.76	

The results obtained on the five basic personality traits among the studies persons show higher levels of agreeableness, conscientiousness and intellect/imagination and lower levels of extraversion and emotional stability. In our sample, the minimum values of agreeableness, conscientiousness and intellect/imagination are quite high. Possible explanation for this is that these are socially desirable characteristics, which leads to giving socially desirable answers. Based on the individuals results calculated, in the scales of most of the personality traits there is an asymmetry – higher agreeableness, higher conscientiousness, higher intellect/imagination, and lower extraversion are observed in the sample (Fig. 3.). In emotional stability factor, the high and low values are approximately equally distributed and the mean value is the lowest.

Statistically significant relations were found between the mean values of four of the studied personality factors and five of the studied descriptive features. The established dependencies lead to the following conclusions: 1) there are lower levels of agreeableness and consciousness in individuals with cleft in chin; 2) there are lower levels of emotional stability in individuals with widow peak; 3) there are higher levels of agreeableness and consciousness in people with separated eyebrow; 4) there are lower levels of consciousness and higher levels of intellect/imagination in people with dimples; 5) there are higher levels of agreeableness and intellect/imagination in persons with free earlobes (with a pendant of the earlobe).

Conclusions

The results of the study provide information on phenotypic diversity concerning some immunological, descriptive and personality characteristics in humans, as well as in the established relations between them. Among the studied sample of 945 individuals, the frequencies of the pairs of traits were established and analyzed together with the found frequencies of the five basic personality characteristics. Future investigations in this field would be useful in studying the phenotypic diversity in different human populations and in the characterizing their anthropogenetic profile.

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