Pol J Aviat Med Psychol 2015; 21(2): 9-19
DOI: 10.13174/pjamp.21.02.2015.02

ORIGINAL ARTICLE

BLOOD GROUPS AND TEMPERAMENTAL TRAITS: EXPLORATORY STUDY

Jan F. TERELAK[1,2], Emilia A. PIETRZYKOWSKA[1]
[1] Cardinal Stefan Wyszyński University, Warsaw, Poland
[2] Military Institute of Aviation Medicine, Warsaw, Poland

Source of support: Own sources
Author's address: J.F. Terelak, Military Institute of Aviation Medicine, ul. Krasińskiego 54, 0-755 Warsaw, Poland, e-mail: jterelak@wiml.waw.pl

Introduction: According to several theories of temperament, it is based on the physiological mechanism consisting of various biological factors. Aim of this study was to examine whether blood groups in the system ABO and Rh are one of this physiological factors.

Methods: The Regulatory Theory of Temperament (RTT) invented by J. Strelau was the theoretical basis of this study. Temperament was measured with the Formal Characteristics-Temperament Inventory (FCB-TI) invented by Strelau. Responders declared their blood groups and their declarations were confirmed by the serological tests. The study included 320 individuals: 161 females and 159 males. They were divided into subgroups according to the blood groups ABO and Rh.

Results: It was found, among other, which in case of such temperamental traits as activity and sensitivity blood groups ABO and Rh really differentiate examined responders.

Discussion: The results are significant only at the level of 4% to 6% of the explained variance but it is sufficient to consider blood type as the one component of the temperament physiological mechanism.

Conclusions: Blood type might be the one of elements of the physiological mechanism of temperament. However, a degree of blood type relationship with temperamental traits seems controversial and requires confirmation in further studies.

Keywords: blood groups ABO and Rh, Strelau's Regulatory Theory of Temperament (RTT), temperamental traits

Figure: 1 • **Tables:** 4 • **References:** 38 • **Full-text PDF:** http://www.pjamp.com • **Indexation:** Index Copernicus, Polish Ministry of Science and Higher Education

INTRODUCTION

Contemporary psychology of temperament takes into consideration both endogenous and exogenous determinants of the individual human behavior [21,30]. It is also stressed that both genes and environment do not directly determine neither temperament nor behavior but do it indirectly through the individual physiological, neurobiological, and/or hormonal differences [10,32]. Numerous authors emphasize that temperament is based on the physiological mechanism but it is "primarily inherited" [37]. However, it does not mean that temperament cannot significantly change under an influence of the adolescence, ageing, and environmental factors [29].

Researches dealing with temperament think that this concept involves individual differences related to the behavior properties both inside the population and between populations. It means that temperament should be considered in the traits categories, i.e. cross-situational consistent behavior or invariable individual predisposition to the defined behavior [30]. These traits are so-called latent variables and cannot be observed directly. They are revealed during measurements and are a symptom of internal mechanisms. Temperamental traits show the highest life-long stability and the highest cross-situational consistency out of other behavioral properties [13].

Temperamental traits, which have biological background (e.g. Pavlov and his followers assumed that they are determined by the type of the nervous system) are inherited [1] and are characteristic for both humans and animals [16]. Concept of the temperament is used for the formal features of each behavior, contrary to the material and personal features [24,34] or only emotional behavior [25].

Basic elements of the Regulative Theory of Temperament by Strelau

Theoretical basis of the own studies is the Regulative Theory of Temperament invented by Strelau [30]. Its name results from temperament considered as a behavior regulator. Strelau's theory include 10 following postulates: (1) temperament reveals in the formal behavioral traits, i.e. not its content but the way in which this content is expressed; (2) temperament is expressed in the energy features (reaction strength) and time (reaction duration); (3) temperament is responsible for relatively constant individual differences; (4) temperament is common and relates to all behaviors and situations; (5) temperament exists since the beginning of the postnatal periods; (6) temperament is seen in both humans and animals; (7) temperament results from the biological evolution and is based on the physiological mechanisms; (8) temperamental traits change in the ontogenesis due to the interaction between the subject and environment; (9) temperament plays a role of the situation energy and time moderator; (10) temperament is particularly responsible for the resistance to stress.

Features of the energy and time behavior levels both regulate stimulation but the role of timely level features is the secondary and depends on the features of energy level configuration. Specific configurations of the temperamental traits have an adaptive value [33,37].

Both base and one of the temperament definition criteria are considered biological-physiological mechanisms, undeniably lying at their base. The secondary factors, participating in the determination of the individual differences related to the temperamental traits, are environmental factors. The arguments for the predominating biological determination of the temperamental traits are provided by the behavior genetics, twins research, and search for the physiological and biochemical correlates of the variables, which mediate temperamental traits development. Genetic factors do not directly influence a behavior: in the human body must exist "transmitters of these differences: anatomical, physiological, and biochemical" [29]. Studies carried out in psychophysiology, physiological psychology or neuropsychology may lead to the discovery of the specific biological temperament mechanism. Our study relates to this particular paradigm. Strelau emphasizes that one should not assume an existence of a sole mechanism and proposes very voluminous term, i.e. "neurohormonal individuality", but one should admit that several biological factors co-exist as one of gears of the hypothetic but real complex mechanism [29]. One of such factors is also blood type.

Blood groups and temperament

Blood accompanies us during the whole life span. A circulatory system and blood are indispensable for the human being already in fetal phase to exchange oxygen and metabolic products with the mother. Transfusiology is based on the knowledge of blood groups, namely antigen diversification of blood elements. Knowledge of the blood antigens enabled to identify 29 human blood systems, 6 "collections", and 2 "series" consisting of antigens, which do not conform criteria of inclusion into the group [28]. The most important and best known blood group systems are: ABO with 4 blood groups: A, B, AB, and 0, and Rh: Rh-

or Rh+ [7]. Progress in the immunology, hematology, and genetics contributed to the knowledge of blood groups [27]. In Poland, percentage of blood groups is the following: A Rh- (1%); B Rh- (2%); 0 Rh- (6%); AB Rh- (6%); AB Rh+ (7%); B Rh+ (15%); 0 Rh+ (31%), and A Rh+ (32%) [22].

Blood group is relatively stable variable. Cases of blood group change during the life span are not known. However, there is a possibility of so-called pseudochange of the blood type because of a decrease in A and B antigens activity and disclosure of H antigen (e.g. in pregnancy or erythrocytes ageing) [9]. According to several scientists, blood does not only determine that fact that we are living but also how we live. In Japan, well known for several decades and rooted typological system of character is "ketsukei-gata", based on the human personality categorization by the blood group in ABO system [20,26]. This belief is so popular that the first question the Japanese asked a newly met person is: "What is your blood group?" [5]. Some employers [19] use this differentiation to select and assess the applications of the candidates to their companies and to build workers teams. In 1930, Furukawa noted that the individuals with particular blood types show specific temperamental characteristics and these two variables are connected. He qualified people with blood group 0 as phlegmatic, A – melancholic, B – sanguine person, and AB as mixed type. Relevant disadvantage of his studies was methodology, especially the way of the results calculation (percent) and method, i.e. use of the own not standardized questionnaire, unjustified in the formulation and evaluation of the psychological theory. Koga and Kato [14] did not confirm the results obtained by Furukawa [8]. Thompson [35], using standardized and methodologically correct intelligence and personality tests (*Thorndike Measures of Intelligence, Thurstone Intelligence Test, Neyman-Kolstead Measures of Introversion-Extraversion, Pressey X-O)* also did not find a relationship between the obtained results and blood type. Cattel et al. [3] performed questionnaire survey, using Cattel HSPQ (*High School Personality Questionnaire*) and proved that there are differences between people in relation to I factor ($F=6.6350$; $df=3$; $p<0.01$), depended on the blood type – persons with A group are more sensitive (*tender-minded, premsic*) than these with O, B, and AB groups (*tough-minded, harric*). Jogawar [12] using the *16PF Test,* developed by Cattell, basing on the results for factor A (cordiality, *outgoing vs. reserved)* and factor C (emotional stability, *stable vs. emotional*), found that the persons with B blood group are less emotionally stable than these with remaining blood groups. Additionally, B blood type achieves higher scores of the factor O (apprehension, *apprehensive vs. placid)*. These results confirm Angst and Maurer-Groeli [2] theses and Wu, Lindstad and Lee [36] studies on the relationship between emotionality and B blood type. The studies by Marutham and Prakash [18] seem to be a confirmation of these findings. The authors used EPI (*Eysenck's Personality Inventory*) and proved that the level of neuroticism is higher in persons with B blood type in comparison with other blood types. Lester and Gatto [15] additionally confirmed that persons with blood groups O and AB achieve higher scores on the extraversion scale as measured with NEO-PI-R questionnaire developed by Costa and McCrae (*Revised NEO Personality Inventory*) than those with blood group A or B. However, Cramer and Imaike [4] in their study with the same inventory showed that there are no differences in personality determined by the blood types. The same conclusion was drawn by Rogers and Glendon [23] in their study with *Goldberg Depression Questionnaire*, alternative for NEO-PI-R.

Recent results of the studies carried out by Wu, Lindsted, and Lee [36], who also used NEO-PI-R questionnaire, contradicted the thesis about any relationship between personality and blood types. However, one cannot omit the fact that the Taiwanese being a control group, used the translated test, which did not undergo cultural adaptation, leading to erroneous results.

Here, it is worth reminding temperament definition by Strelau [29], to which our study refers. Temperament has a status of theoretical construct and is objectively existing latent tendency manifesting itself in the behavior. Its temporal and situational stability is determined by the interactions between the complex physiological and biochemical mechanisms and also modified by an influence of both physical and social environment.

METHODS

Model of the own studies

Basing on the above-presented theoretical factors, a hypothesis about an existence of the blood types and temperamental traits might be put forward. Blood group would be here the one component of the complex physiological mechanism of the temperament. According to Strelau's view on temperament, the blood type may be compared with "a property, which cannot be observed directly" and which produces different intensity of the temperamental traits [29]. At the same time, it seems obvious that the environmental condition

and disturbing variables as well as other elements of the physiological mechanism of temperament may affect the final result. Therefore, our own study has mainly explorative character.

Data in available literature enable to put forward a hypothesis that there is a relationship between some temperamental traits as presented by Strelau and blood groups AB0 and Rh. We would like to avoid hasty setting its direction because of the lack of explicit theoretical justifications. Therefore, we put forward cautious hypothesis that the individuals with different blood groups will differ in the intensity of temperamental traits.

Responders

For the practical purposes, the responders were selected by the stratified random sampling. The whole examined group was N=320 (Rh-: n=160; Rh+: n=160), and the number of responders in the groups distinguished by AB0 and Rh factors was identical: 0 Rh-: n=40; 0Rh+: n=39; A Rh-: n=39; A Rh+: n=40; AB Rh-: n=40, AB Rh+: n=40; B Rh-: n=41; B Rh+: n=40. As the variables measured with TCB-TI inventory show diversified intensity associated with gender, the number of female and male responders in both the whole examined group and subgroups was equalized (n=40). A 2-factor variance analysis (AB) factor x Rh factor: 4 x 2) did not show a difference in age in the groups (factor AB0 effect: $F(3.312))=1.91$; $p=0.128$, Rh factor effect: $F(1.312)=2.565$; $p=0.11$; effect of both factors: $F(3.312)=0.866$; $p=0.459$). Age distribution in the comparable groups was not normal but taking into consideration the same number of responders in the subgroups and conformation with variance homogeneity, the result of the above analysis may be considered reliable.

Research tools

To diagnose temperament as presented by Strelau, the *Formal Characteristics of Behavior-Temperamental Inventory* (FCB-TI) was used. This tool was developed in the ultimate form in 1992, being optional to the Strelau Temperamental Inventory (STI) items. This way research technique is closely associated with the scientific source and the results may be transferred to ground of theoretical deliberations. FCB-TI contains 20 items for each 6 scales: briskness (B), perseverance (PE), sensory sensitivity (SS), emotional reactivity (ER), endurance (E), and activity (AC). The results distribution, reliability, time stability, and correctness are satisfactory.

Procedure

The study was carried out in the Regional Center of Blood Donation and Hemotherapy in Warsaw. Blood groups in AB0 system and Rh factor were supplemented by the responders oral statement and confirmed by the serological tests, available for inspection only because of the personal data protection and anonymous character of this study.

Statistical analyses

Due to the fact that this study was of explorative character and put forward hypothesis had general character, two types of the statistical analysis were performed. In the first, AB0 and Rh factors were considered independent variables in order to evaluate the role of both blood type characteristics as a separate variable and their possible interactions. In the second analysis, blood group was considered as one independent variable consisting of all possible combination of AB0 and Rh factors.

In the first analysis, AB0 (4 values: 0, A, B, AB) and Rh (2 values: Rh+ and Rh-) factors were independent variables. Dependent variables were the raw results obtained in FCB-TI scales. Therefore, 6 dependent variables were analyzed: briskness (B), perseverance (PE), sensory sensitivity (SS), emotional reactivity (ER), endurance (E), and activity (AC). To verify the hypothesis, UNIANOVA analysis was carried out in the cross-group scheme (AB0 x Rh: 4 x 2). In case of interactions simple effects were analyzed with least significant differences (LSD) test.

In the second type of analysis, blood group (8 values: 0+, A+, B+, AB+, 0-, A-, B-, AB-) was an independent variable. The raw results obtained in the FCB-TI scales were considered the dependent variables. To verify the hypothesis ANOVA analysis of variance was performed. In case of the presence of significant effect LSD test was used to compare pairs *post hoc*. Normal distribution of the dependent variables in the compared groups was verified with Shapiro-Wilk test and variance homogeneity with Levene test. All results were considered significant at $p<0.05$.

RESULTS

Two-factor model

Use of a two-factor analysis aimed at attempting to answer the question: how both factors AB0 and Rh, considered independently, determine the level of temperamental traits? An analysis with Shapiro-Wilk test showed that the distribution of

a variable: briskness, perseverance, sensory sensitivity, emotional reactivity, and endurance differ from the normal. However, the results of a two-factor variance analysis may be considered reliable because of the variance homogeneity in the subgroups and the same number of participants despite the fact that blood group within both AB0 and Rh factor does'nt differentiate the subjects in relation to such temperamental traits as:

– *Briskness* [at the level of a two-factor variance analysis in the range of AB0 factor {F(3.312)}=1.828; p=0.142), Rh{F(1.312)}=1.58, p=0.325) and the interactions between them: AB0 x Rh{F(3.312)=0.703; p=0.551)].
– *Perseverance*: [at the level of a two-factor variance analysis in the range of AB0 factor {F(3.312)} =0.593; p=0.62}' Rh{F(1.312)=0.97; p=0.325} and the interactions between them: AB0 x Rh {F(3.312)=0.703; p=0.551}].
– *Sensory sensitivity*: [at the level of a two-factor variance analysis in the range of AB0 factor [{F(3.312)}=2.288; p=0.079}, Rh{F(1.312)=1.58; p=0.21} and the interactions between them: AB0 x Rh {F(3.312)=2.255; p=0.082].
– *Emotional reactivity*: [at the level of a two-factor variance analysis in the range of AB0 factor {F(3.312)}=0.159; p=0.924}, Rh{F(1.312)=0.425; p=0.515} and the interactions between them: AB0 x Rh {F(3.312)=1.603; p=0.189].
– *Endurance:* [at the level of a two-factor variance analysis in the range of AB0 factor {F(3.312)}=0.385; p=0.764}, Rh{F(1.312)=0.018; p=0.895} and the interactions between them: AB0 x Rh {F(3.312)=1.886; p=0.132}].

Only *activity* in this case blood group differentiates the examined individuals.

Detailed results of a two-factor variance analysis for the dependent variable – activity – are shown in Tab. 1.

The results presented in Tab. 1. showed insignificant interaction between ABO x Rh ($F_{(3.312)} = 4.379$; $p<0.01$; $\varsigma_{p2} = 0.04$) while an influence of both ABO factor ($F_{(3.312)} = 1.843$; p=0.139 and Rh ($F_{(1.312)} = 1.61$; p=0.205). As the interaction between AB0 and Rh proved to be significant, an analysis of the simple effects of both factors.

As far as the simple effects of blood types AB0, in group of responders with Rh- significant differences between the subjects with blood groups 0 and AB ($p<0.001$), 0 and B ($p<0.05$), and A and AB ($p<0.001$) were seen. In Tab. 1. one may see that in the subjects with Rh- these with blood groups AB and B are characterized by the lower activity than with blood group 0. Moreover, an activity of the individuals with blood group AB is also lower than that in group A. In the individuals with Rh+ no differences between subgroups distinguished on the basis of AB0 factor were noted.

As far as the differences between the responders with Rh- and Rh+ are concerned, only difference was noted in AB blood group ($p<0.001$). As it results from Fig. 1., in the subgroup of responders with blood group AB an activity is higher in case of Rh+ than that in the group AB Rh-. It proved that the hypothesis was confirmed in case of activity: blood group differentiates people in relation to this temperamental trait.

One-factor model

ANOVA analysis aimed at comparing all blood groups between them. Collective results of ANOVA analysis are shown in Tab. 2. (statistically significant results are printed in semibold types).

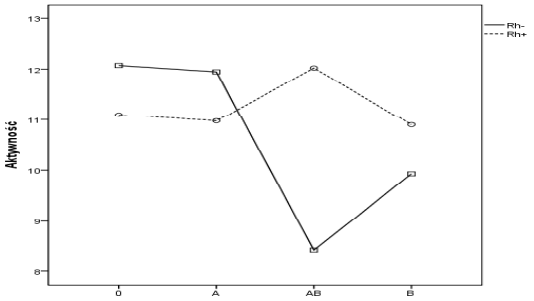

Fig. 1. Activity (Aktywność) level of subjects with different blood group

Tab. 1. Results of a two-factor variance analysis for the dependent variable: activity.

Source	Type III of the sum	df	Mean of squares	F	Significance	Partial Eta squared
Corrected Model	434.344	7	62.049	2.901	.006	.061
Constant	38166.464	1	38166.464	1784.127	.000	.851
AB0 factor	118.261	3	39.420	1.843	.139	.017
Rh factor	34.433	1	34.433	1.610	.205	.005
AB0 factor	281.027	3	93.676	**4.379**	**.005**	.040
Rh factor Error	6674.378	312	21.392			
Total	45237.000	320				
Corrected Total	7108.722	319				

Tab. 2. Collective results of the ANOVA variance analysis for all dependent variables.

	Source	Type III of the sum of squares	df	Mean of squares	F	Partial Eta squared
ŻW	**Between groups**	178.64	7	25.52	1.915	.067
	Inside groups	4158.33	312	13.32		
	Total	4336.98	319			
PE	**Between groups**	96.48	7	13.78	694	.677
	Inside groups	6197.002	312	19.862		
	Total	6293.487	319			
WS	**Between groups**	174.919	7	24.988	2.161	.037
	Inside groups	3607.003	312	11.561		
	Total	3781.922	319			
RE	**Between groups**	147.668	7	21.095	.813	.577
	Inside groups	8094.519	312	25.944		
	Total	8242.188	319			
WT	**Between groups**	187.868	7	26.838	.976	.449
	Inside groups	8582.120	312	27.507		
	Total	8769.988	319			
AK	**Between groups**	434.344	7	62.049	2.901	.006
	Inside groups	6674.378	312	21.392		
	Total	7108.722	319			

In case of the *sensory sensitivity* ANOVA test showed that the individuals with different blood groups differ in relation to this temperamental trait ($F(7.312) = 2.161$; $p<0.05$; $ç2 = 0.046$.

Moreover, *post hoc* analysis was performed to find whether sensory sensitivity is lower in people with blood group 0 Rh+ in comparison with the remaining blood groups. Detailed results of this analysis are shown in Tab. 3.

Post hoc analysis showed that sensory sensitivity in people with blood group 0 Rh+ was lower than that in the remaining blood groups ($p<0.005$; see Tab. 4.) and did not differ only in case of blood group B Rh-. It means that the hypothesis was

Tab. 3. Comparison in pairs with LSD test in relation to the sensory sensitivity.

Dependent variable	(I) group	(J) group	Difference of mean (I – J)	SD	Significance	95% confidence interval	
						Lower limit	Upper limit
WS	**0-**	A-	-1.015	.765	.185	-2.52	.49
		B-	.454	.756	.549	-1.03	1.94
		AB-	.050	.760	.948	-1.45	1.55
		0+	1.700	.760	**.026**	.20	3.20
		A+	175	.760	.818	-1.32	1.67
		B+	.100	.760	.895	-1.40	1.60
		AB+	-.575	.760	.450	-2.07	.92
	A-	0-	1.015	.765	.185	-.49	2.52
		B-	1.469	.761	.054	-.03	2.97
		AB-	1.065	.765	.165	-.44	2.57
		0+	2.715	.765	.001	1.21	4.22
		A+	1.190	.765	.121	-.32	2.70
		B+	1.115	.765	.146	-.39	2.62
		AB+	.440	.765	.565	-1.07	1.95
	B-	0-	-.454	.756	.549	-1.94	1.03
		A-	-1.469	.761	.054	-2.97	.03
		AB-	-.404	.756	.594	-1.89	1.08
		0+	1.246	.756	.100	-.24	2.73
		A+	-.279	.756	.713	-1.77	1.21
		B+	-.354	.756	.640	-1.84	1.13
		AB+	-1.029	.756	.174	-2.52	.46

AB-	0-	-.050	.760	.948	-1.55	1.45
	A-	-1.065	.765	.165	-2.57	.44
	B-	.404	.756	.594	-1.08	1.89
	0+	1.650	.760	.031	.15	3.15
	A+	.125	.760	.870	-1.37	1.62
	B+	.050	.760	.948	-1.45	1.55
	AB+	-.625	.760	.412	-2.12	.87
0+	0-	-1.700	.760	.026	-3.20	-.20
	A-	-2.715	.765	.001	-4.22	-1.21
	B-	-1.246	.756	.100	-2.73	.24
	AB-	-1.650	.760	.031	-3.15	-.15
	A+	-1.525	.760	.046	-3.02	-.03
	B+	-1.600	.760	.036	-3.10	-.10
	AB+	-2.275	.760	.003	-3.77	-.78
A+	0-	-.175	.760	.818	-1.6	1.32
	A-	-1.190	.765	.121	-2.70	.32
	B-	.279	.756	.713	-1.21	1.77
	AB-	-.125	.760	.870	-1.62	1.37
	0+	1.525	.760	.046	.03	3.02
	B+	-.075	.760	.921	-1.57	1.42
	AB+	-.750	.760	.325	-2.25	.75
B+	0-	-.100	.760	.895	-1.60	1.40
	A-	-1.115	.765	.146	-2.62	.39
	B-	.354	.756	.640	-1.13	1.84
	AB-	-.050	.760	.948	-1.55	1.45
	0+	1.600	.760	.036	.10	3.10
	A+	.075	.760	.921	-1.42	1.57
	AB+	-.675	.760	.375	-2.17	.82
AB+	0-	.576	.760	.450	-.92	2.07
	A-	-.440	.765	.565	-1.95	1.07
	B-	1.029	.756	.174	-.46	2.52
	AB-	.625	.760	.412	-.87	2.12
	0+	2.275	.760	.003	.78	3.77
	A+	.750	.760	.325	-.75	2.25
	B+	.675	.760	.375	-.82	2.17

confirmed in case of the sensory sensitivity: blood group differentiates people in relation to this temperamental trait.

– ***Activity***

ANOVA analysis (see Tab. 4.) showed that the activity is different in people with different blood groups ($F(7.312) = 2.901$; $p<0.01$; $ç2 = 0.061$).

Moreover, post hoc analysis showed that the activity was lower in people with blood group AB Rh- than that in the remaining blood groups ($p<0.005$), except group B Rh-. These two groups did not differ. Activity of people with blood group B Rh- was lower in comparison with blood groups AB Rh+ and 0 Rh-. It means, therefore, that the hypothesis was confirmed in case of the activity: blood group differentiates people in relation to this temperamental trait.

DISCUSSION

The obtained results showed that the hypothesis was not confirmed in case of the following temperamental traits as presented by Strelau: briskness, preservation, emotional reactivity, and endurance. A two-factor model indicated a role of ABO characteristics in the differentiation of people in relation to the activity but only in the subjects with Rh-, while Rh+ differentiated the examined subjects' activity but only those with AB group. Moreover, a one-factor model indicated a role of the blood type in the differentiation of activity and additionally of the sensory sensitivity. Taking both models into consideration, it is possible to say that put forward hypothesis was confirmed for both activity and sensory sensitivity: in case of these two mood dimensions we found differences associated with blood group.

Tab. 4. Comparison in pairs with LSD test in relation to the activity.

Dependent variable	(I) group	(J) group	Difference of mean (I – J)	SD	Significance	95% confidence interval	
						Lower limit	Upper limit
WS	**0-**	A-	.126	1.041	.904	-1.92	2.17
		B-	2.148	1.028	.037	.13	4.17
		AB-	3.650	1.034	.001	1.62	5.68
		0+	.975	1.034	**.347**	-1.06	3.01
		A+	1.100	1.034	.288	-.93	3.13
		B+	1.175	1.034	.257	-.86	3.21
		AB+	.050	1.034	.904	-1.98	2.08
	A-	0-	-.126	1.041	.185	-2.17	1.92
		B-	2.022	1.035	.052	-.01	4.06
		AB-	3.524	1.041	.001	1.48	5.57
		0+	.849	1.041	.415	-1.20	2.90
		A+	.974	1.041	.350	-1.07	3.02
		B+	1.049	1.041	.314	-1.00	3.10
		AB+	-.076	1.041	.942	-2.12	1.97
	B-	0-	-2.148	1.028	.037	-4.17	-.13
		A-	-2.022	1.035	.052	-4.06	.01
		AB-	1.502	1.028	.145	-.52	3.52
		0+	-1.173	1.028	.255	-3.20	.85
		A+	-1.048	1.028	.309	-3.07	.97
		B+	-.973	1.028	.344	-3.00	1.05
		AB+	-2.098	1.028	.042	-4.12	-.08
	AB-	0-	-3.650	1.034	.001	-5.68	-1.62
		A-	3.524	1.041	.001	-5.57	-1.48
		B-	-1.502	1.028	.145	-3.52	.52
		0+	-2.675	1.034	.010	-4.71	-.64
		A+	-2.550	1.034	.014	-4.58	-.52
		B+	-2.475	1.034	.017	-4.51	-.44
		AB+	-3.600	1.034	.001	-5.63	-1.57
	0+	0-	-.975	1.034	.347	-3.01	1.06
		A-	-.849	1.041	.415	-2.90	1.20
		B-	1.173	1.028	.255	-.85	3.20
		AB-	-2.675	1.034	.010	.64	4.71
		A+	.125	1.034	.904	-1.91	2.16
		B+	.200	1 034	.847	-1.83	2.23
		AB+	-.925	1.034	.372	-2.96	1.11
	A+	0-	-1.100	1.034	.288	-3.13	.93
		A-	-.974	1.041	.350	-3.02	1.07
		B-	1.048	1.028	.309	-.97	3.07
		AB-	2.550	1.034	.014	.52	4.58
		0+	-.125	1.034	.904	-2.16	1.91
		B+	-.075	1.034	.942	-1.96	2.11
		AB+	-1.050	1.034	.311	-3.08	.98
	B+	0-	-1.175	1.034	.257	-3.21	.86
		A-	-1.049	1.041	.314	-3.10	1.00
		B-	973	1.028	.344	-1.05	3.00
		AB-	-2.475	1.034	.017	.44	4.51
		0+	-.200	1.034	.847	-2.23	1.83
		A+	.075	1.034	.942	-2.11	1.96
		AB+	-1.125	1.034	.278	-3.16	.91

AB+	0-	-.050	1.034	.961	-2.08	1.98
	A-	.076	1.041	.942	-1.97	2.12
	B-	2.098	1.028	.042	.08	4.12
	AB-	3.600	1.034	.001	1.57	5.63
	0+	.925	1.034	.372	-1.11	2.96
	A+	1.050	1.034	.311	-.98	3.08
	B+	1.125	1.034	.278	-.91	3.16

According to the study by Furukawa [8], earlier criticized by us, blood type has an influence on temperament in 80–90 cases per 100. Such results seem to mean something. Our study methodologically confirmed this assumptions only partially. Loehlin [17] in his publication indicated that fact that there are no clear-cut proofs that personality traits or temperament, determined biologically or environmentally, differ in the hereditary process. Taking the above into consideration, the results of the previous studies and temperament correlated with various personality traits showed by Zawadzki, Strelau [38] and Terelak [32] and bearing in mind that this study is of explorative character, one should indicate convergence with the results reported by Lester and Gatto [15], who showed that AB and 0 blood groups are characterized by extraversion, i.e. the higher score of the activity scale of 0 Rh- and AB Rh+ groups. Cattel et al. [3] reported that the individuals with blood group B are characterized by the low sensitivity (tough mindness), which corresponds with a lower score in sensory sensitivity scale obtained in case of the individuals with B Rh- group. Our results do not match the results reported by Lester and Gatto [15], Cattel et al. [3] or the results obtained by Furukawa [8] or Marutham and Prakash [18]. However, it should be borne in mind that the analyses showed that blood group in AB0 and Rh systems really differentiated the examined individuals in case of an activity and sensory sensitivity. It corresponds with 4% to 6% variance, which may be treated as a low result. At the same time, it enables to assume that temperamental traits of the normal population are distributed in a different way than accidentally between the individuals with different blood types. Before blood group can be included to the components of the temperament physiological mechanism, the studies should be repeated; may in the larger group of the examined individuals or other populations (different countries), where the distribution of blood groups is different [26]. It would be worth tracing blood groups sources, i.e. genes responsible for their formation, antigens, and chemical compounds being their basis. It may be difficult because of the problems with isolation of the single compounds and their effects from so complex and multiplanar system – human body. One should also remember about an influence of an environment. Lamarck [11] was already convinced that the environment influencing the body determines education, solidification and transfer of the body characteristics. Expression of the certain genes is higher as a result of environmental influence and external conditions, while the expression of other genes in inhibited. Eliasz and Angleiter [6] distinguish irreversible and reversible changes. However, it is difficult to find whether such changes occurred in the examined individuals. In the experimental model it is also difficult to exclude an effect of Heisenberg's uncertainty principle. Certain phenomena cannot be investigated as a technique of such an investigation deforms reality, so that it is impossible to say what a deformity produced by the investigational technique and what is reality. However, reductionism, i.e. an attempt to explain a complex set of problems by their simplest components, is undoubtedly incomplete approach but may constitute a very creative way, one of the "motor of science" because constant attempts to divide the events into smaller parts and their methodological explanation, step by step [11]. The results of our own study are significant only at the level of 4% to 6% of the explained variance but it is sufficient to consider blood type as the one component of the temperament physiological mechanism. If the set of these components is numerous, our results may be its important part to be considered interesting from the theoretical-cognitive point of view.

As a criticism of this study one may accept the fact that despite the general result confirming a relationship between blood groups and temperament results from the theory (blood groups as a component of the temperament physiological mechanism) no theoretical basis for the partial results exists as any theory did showed clearly why the individuals with Rh+ group are characterized by the lower sensory sensitivity.

If our results will be confirmed in the repeated studies, in for instance larger groups or other populations, this study could be a basis and indi-

cation of the direction of the further search for the components of the temperament physiological mechanism as presented by Strelau [30].

CONCLUSIONS

In case of the activity and sensitivity as the mood features as presented by Strelau, there are differences associated with various blood groups in ABO and Rh systems: blood groups explain 4% to 6% of the variance.

The obtained results may suggest that blood groups is one of the components of the temperament physiological mechanism.

Before the blood groups could be included into the components of the temperament physiological mechanism, the studies should be repeated. In larger groups or different populations (countries), where the distribution of the blood types id different.

AUTHORS' DECLARATION:

Study Design: Jan F. Terelak, Emilia A. Pietrzykowska; **Data Collection:** Emilia A. Pietrzykowska; **Statistical Analysis**: Emilia A. Pietrzykowska; **Manuscript Preparation:** Jan F. Terelak; **Funds Collection:** Jan F. Terelak, Emilia A. Pietrzykowska. The Authors declare that there is no conflict of interest.

REFERENCES

1. Allport GW. Becoming: Basic Considerations for a Psychology of Personality. New Haven: Yale University Press; 1960.
2. Angst J, Maurer-Groeli Y. Blood groups and Personality. Archiv fur Psychiatric and Nervenkrankbeiten 1974; 218: 291–300.
3. Cattel R, Boutourline Young HB, Hundleby JD. Blood groups and personality traits". Am J Hum Gene 1984; 16(4): 397-402.
4. Cramer KM, Imaike E. Personality, blood type, and the five-factor model. Pers Individ Dif 2002; 32:621–626.
5. Crane C. What's your type? Sci World 2007; 64(5/6):8.
6. Eliasz A, Angleitner A, eds. Advances in research on temperament. Langerich: Pabst Science Publishes; 2001.
7. Fabijańska - Mitek J, ed. Immunologia krwinek czerwonych. Grupy krwi. Warszawa: OINPHARMA; 2007.
8. Furukawa T. A study of temperament and blood-groups. J Soc Psychol 1930; 1:494-509.
9. Gołąb J, Jakóbisiak M, Lasek W, Stokłosa T. Immunologia. Warszawa: Wydawnictwo Naukowe PWN; 2009.
10. Hampton SE, Colman AM, eds. Psychologia różnic indywidualnych. Poznań: Wydawnictwo Zysk i S-ka; 2000.
11. Jędrzejczak WW. Zagadka tworzenia krwi. Warszawa: Wydawnictwo Wiedza Powszechna; 1987.
12. Jogawar V. Personality correlates of human blood groups. Pers Individ Dif 1983; 4(2):215-216.
13. Kagan J, Fox NA. Biology, Culture and Temperamental Biases. In Eisenberg N, ed. Handbook of Child Psychology, Volume Three: Social, Emotional and Personality Development. Hoboken: John Wiley & Sons; 2006:167-225
14. Koga Y, Kato H. A study of character and temperament. Jpn J App Psychol 1934; 2:382-417.
15. Lester D, Gatto J. Personality and blood group. Pers Individ Dif 1987; 8:267.
16. Locurto C. Individual differences and animal personality. Comp Cogn Behav Rev 2007; 2:67-78.
17. Loehlin JC. Are California Psychological Inventory items differently heritable? Behavior Genetics 1986; 16(6):599-603.
18. Marutham P, Prakash I. A study of the possible relationship of blood types to certain personality variables. Indian J Clin Psychol 1990; 17(2):79-81.
19. Miller L. People Types: Personality Classification in Japanese Women's Magazines. Journal of Popular Culture 1997; 31(2):143-159.

20. Mizoguchi H. Studies on the relationship between blood type and personality in foreign countries. Kagakushi Kenkyu. J Hist Sci Japa 1993; 32(187):152-156.

21. Oniszczenko W, Dragan WŁ. Struktura temperamentu w ujęciu regulacyjnej teorii temperamentu a polimorfizmy w genach 5-HTT, DAT1 i DRD4 u młodych kobiet. Neuropsychiatr Neuropsychol 2006; 1:24-30.

22. Regional Center of Blood Donation and Hemotherapy in Warsaw, Biuletyn Informacyjny 2011; 1.

23. Rogers M, Glendon A. Blood type and personality. Pers Individ Dif 2003; 34(7):1099-1112.

24. Rothbart MK, Bates JE. Temperament. In Eisenberg N. ed. Handbook of Child Psychology, Volume Three: Social, Emotional and Personality Development. Hoboken: John Wiley & Sons; 2006:99-166.

25. Saarni C, Campos JJ, Camras LA, Witherington D. Emotional Development: Action, Communication, and Understanding. In Eisenberg N. ed. Handbook of Child Psychology, Volume Three: Social, Emotional and Personality Development. Hoboken: John Wiley & Sons; 2006:226-299.

26. Sakamoto A, Yamazaki K. Blood-typical Personality stereotypes and Self-fulfilling Prophecy: A Natural Experiment with Time-series Data of 1978-1988. Prog Asian Social Psychol 2002; 4: 239-262.

27. Seigworth GR. Bloodletting over the centuries. NY State J Med 1980; December:2022-2028.

28. Sonica B, ed. Podstawy Serologii Grup Krwi. Kraków: Wydawnictwo Uniwersytetu Jagiellońskiego; 2008.

29. Strelau J. Psychologia Temperamentu. Warszawa: Wydawnictwo Naukowe PWN; 2002.

30. Strelau J. Temperament jako Regulator Zachowania z Perspektywy Półwiecza Badań. Gdańsk: Gdańskie Wydawnictwo Psychologiczne; 2006.

31. Strelau J, Terelak J. The alpha-index in relation to temperamental traits. Studia Psychologica 1974; 16(1):40-50.

32. Terelak J. Alpha index and personality traits o pilot. Aviat Space Environ Med 1976; 47 (2):133-136.

33. Terelak JF, Jachnis A. Characteristics of temperament and thinking as related to psychomotor efficiency in stress. Pers Individ Dif 1994; 16(6): 89-991.

34. Thomas A, Chess S. Temperament and Development. New York: Brunner/Mazel Publishers; 1977.

35. Thompson G. Blood type as related to intelligence, emotions, and personality. J App Psychol 1936; 20(6):785-789.

36. Wu K, Lindsted K, Lee J. Blood type and the five factors of personality in Asia. Pers Individ Dif 2005; 38(4):797-808.

37. Zawadzki B. Temperament – Geny i Środowisko. Porównania Wewnątrz- i Międzypopulacyjne. Sopot: Gdańskie Wydawnictwo Psychologiczne; 2002.

38. Zawadzki B, Strelau J. Formalna Charakterystyka Zachowania – Kwestionariusz Temperamentu (FCZ-KT). Podręcznik. Warszawa: Pracownia Testów Psychologicznych Polskiego Towarzystwa Psychologicznego; 1997.

ACKNOWLEDGEMENTS

The authors wish to thank the Director of the Regional Center of Blood Donation and Hemotherapy for his consent for performing this study.

Cite this article as: Terelak JF, Pietrzykowska EA. Blood Groups and Temperamental Traits: Exploratory Study. Pol J Aviat Med Psychol 2015; 21(2): 9-19. DOI: 10.13174/pjamp.21.02.2015.02