No Tendencies of Personality Traits in Blood Groups: a cross-sectional study conducted on Bangladeshi people.

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Abstract

No studies to date came up with fruitful consequences regarding if or not there is a relationship between blood groups and personality traits rather providing most conflicting, floundering, discrete, equivocal outcomes. Traditionally, Japanese and Korean people support the conception that there are natural inclinations of personality traits in blood groups. Our study aims to explore the rationality of this conception that personality traits and blood groups are interrelated. However, responses of the participants were collected using 50 items big-five factor personality inventory developed by Goldberg: Extraversion, Agreeableness, Neuroticism, Conscientiousness, Intellect (Openness to experience). A two way multivariate analysis (MANOVA) was performed on total 148 participants including 85 males and 65 females using IBM SPSS Statistics version 26. MANOVA results revealed that neither the significant main effect of blood groups [$F(15,414) = 1.102, p > 0.05$] nor had the significant interaction effect of blood groups and gender [$F(15,414) = 1.111, p > 0.05$] on the combined dependent variables. But this study found significant main effect of gender on the combined dependent variables [$F(5,136) = 4.520, p = 0.001, (1-\beta) = 0.967, \eta^2 = 0.143$]. This present study does not support the idea that there is significant relationship between blood groups and personality traits. But the idea that male personality significantly differs from female personality is well-supported by this study.

Introduction:

The notion of having possible relationship between blood types and personality traits is not noble, which is presumed to start coagulating since the discovery of ABO blood groups by Landsteiner in 1901 (Hobgood, 2011). But till now, no scientific solidarity has been achieved with regards to this notion. Scientists have been searching the connection of personality traits being the reflection of the specific patterns of thoughts, feelings and behaviors of an individual (Diener & Lucas, 2021). Some previous studies mentioned that genetic materials explain 50% of what personality traits a person will have and socio and cultural factors, environmental factors such as stressful life condition, parenting style, socio-economic status etc. influence the remaining thereof (Khaledian et al., 2013; Tsuchimine et al., 2015). But, which genes or genetic materials have guidance on the development of personality traits is still under scrutiny (Wu et al., 2005). As blood groups are genetically determined and can easily be identified, therefore, scientists are much more interested about blood groups (Rogers & Glendon, 2003). Tsuchimine et al., (2015) anticipated that ABO genes could have indirect effects on personality traits, demonstrating the hypothesis of Hobgood, (2011) suggesting ABO genes are in linkage disequilibrium with DBH (Dopamine beta hydroxylase) genes. Supporting that, Furukawa, (1927) reported blood groups are significant determinant of temperament. In addition, Japanese and Korean traditionally believe the possible influence of blood groups on personality traits, mental state, temperament and harmony with others (Hobgood, 2011; Pisk et al., 2019). Their belief is not completely irrational because blood groups were found to associate with certain diseases having small to moderate impact on personality characteristics of an individual. For instance, some previous studies showed the linkage of blood groups with peptic ulcer, cancer, cardiovascular disease, stress response-related immune disease, smoking

prevalence etc. Presumably, these diseases might have linkage with specific personality traits such as depression, anxiety, which explain the likelihood of having relationship between blood groups and personality traits (Hobgood, 2011; Kumar et al., 2021; Tsuchimine et al., 2015). Furthermore, psychological and mental problems having hereditary connection with blood groups are thought to arise from the weakness in personality building, which also suggest there could have tendencies of personality traits in blood groups (Alsadi, 2020).

From the beginning, a number of personality testing instruments have been used to unfold the possible relationship between blood groups and personality traits. Among them some used two dimensions of personality (such as Cloninger's low Reward Dependence vs high Reward Dependence, high Anger vs low Anger etc.), some used three dimensions of personality (such as Eysenck's Personality Theory), some used five dimensions known as five factor model (such as NEO-PI, Goldberg's instrument), a recent study used seven dimensions of personality (such as Temperament and Character Inventory) and so on. As compared to other instruments, five factor models are widely accepted and used because of their capability of adjusting other structures and arranging a range of characteristics which are beneficial in clinical psychology (Paul et al., 1992; Rogers & Glendon, 2003).

Review of some previous studies showed the inconsistent outcomes of the personality assessments. Some studies claimed they obtained significant relationship between blood groups and personality traits while some studies stated they did not observe any inclination of personality traits in blood groups. Cramer & Imaike, (2002) at the University of Windsor in Southwestern Ontario, Canada, studied 419 psychology undergraduates using 60-items NEO-PI. They reported that they did not get any significant relation between blood groups and personality traits. In the same year, Rogers & Glendon, (2003) came up with similar result that they did not get any relation between and personality traits. Unlikely here they used Goldberg, (1992) instrument instead. In Asia for first time, Wu et al., (2005) conducted personality assessment in a large scale with 2681 participants using Neuroticism Extroversion Openness Personality Inventory Revised (NEO PI-R). But the consequence is in harmony that no relation was found between personality traits and blood groups. Nahida & Chatterjee, (2016) reported that they did also find no correlation between blood groups and personality, that is parallel to the outcomes described above, although they used Eysenck's Personality Questionnaire Revised (EPQ-R) and sample size was small (N = 100). Alsadi, (2020) at Al Istiqlal University, Jericho, Palestine, studied 337 physically healthy students using Eysenck Personality Inventory and found no positive relationship between personality and blood groups. The conclusion that no relation exists between blood groups and personality traits are further supported by the outcomes of a recent study conducted by Kumar et al., (2021) using Neuroticism Extroversion Openness Five-Factor Inventory (NEO-FFI).

Alternatively, Sivaraman et al., (2018) in a tertiary teaching hospital performed personality assessment using Eysenck's Questionnaire. They reported that introvert behavior and neuroticism behavior are significantly related with all blood groups [$P = 0.0218$, $P = 0.0175$ respectively], although they did not find statistically significant relation between extrovert behavior and all blood groups [$P = 0.316$]. Ahmadian et al., (2015) reported that they observed statistically significant inclinations of openness and extroversion

in different blood types [$P = 0.04$]. But they did not obtain significant relationships of conscientiousness, neuroticism, agreeableness with different blood types. In the same year, Tsuchimine et al., (2015) conducted personality assessment using Temperament and Character Inventory (TCI). They reported that they observed a significant association between ABO blood group genotypes and personality traits in a large number of healthy Japanese subjects [$N = 1427$, $P = 0.001$]. They showed blood group A had significantly higher Persistence than blood groups B and O [$P = 0.032$].

As to describe the relationship between gender and personality traits, some previous studies support the statement that personality traits of males significantly differ from that of females is supported Cramer & Imai, (2002), Kumar et al., (2021) and Rogers & Glendon, (2003). For instance, Cramer & Imai, (2002) reported that as compared to females, males score significantly higher on both Agreeableness and Neuroticism. This outcome is partly supported by Kumar et al., (2021). They stated that females comparatively score higher in agreeableness than males. On the other side, some studies reported that they did not find any significant relation between gender and personality traits. For instance, Tsuchimine et al., (2015) reported no significant relationship between ABO genotypes and gender was found. Besides, Rinieris & Christodoulou, G. N. & Stefanis, (1980) and Lester, D., & Gatto, (1987) reported partly the same result that no relationship found between gender and Neuroticism.

However, there is still no scientific consensus whether personality traits are independent of blood groups or not because research consequences absolutely consistent with that of other researches done earlier have not been obtained yet, which craves for the increment of the number of well-planned research on this field. The more research, the more chance to reach out the suitable conclusion. Our study is another attempt to find out the conclusive statement. The aims and objectives of this present study is to check the rationality of the thoughts of having relationship between blood groups and personality traits.

Methods And Materials

2.1 Participant and Procedure:

A cross-sectional survey was carried out in Bangladesh using Goldberg, (1992) instrument based on online platform during covid-19 pandemic. Given a message through Facebook messenger to take part in this survey continued for 17 days, More than 200 randomly selected individuals were invited and instructed to complete the Google form of 50 items big five questionnaire sent them with the same message. They were assured to keep their data confidential and requested to choose blood group “Don’t know” when there is a confusion aroused regarding correct blood type. Of all invited to participate, 152 individuals responded, from them four individuals with blood group option “don’t know” were excluded out of the actual data set, Therefore, actual case number were 148 among them 57% male and 43% female, 23% A, 32% B, 12% AB, 33% O, age of them ranging from 18 to 30 [Table 1].

Table 1
Distribution of respondents

Blood type	Male	Female	Total
A	22	12	34
B	29	19	48
AB	7	10	17
O	27	22	49
Total	85	63	148

2.2 Instrument of analysis:

A self-report big five inventory of 50 bipolar items developed by Goldberg, (1992) was used, which was divided into five dimensions while each had 10 items. For response, five-point Likert scale was used where for positive personality dimensions: Extraversion, Intellect, Agreeableness, or Conscientiousness, maximum score (4) was given for strongly agree and minimum score (0) for strongly disagree and for Neuroticism, maximum score (4) was considered for strongly disagree and minimum score (0) for strongly agree. Cronbach's alpha for five factors estimated by Goldberg are extraversion (0.81), agreeableness (0.72), conscientiousness (0.78), neuroticism (0.85), and Intellect (0.79), averaging (0.79) for five factors in the quasi-random bipolar scale format, and average inter-factor correlation was 0.20 (Paul et al., 1992) cited by (Rogers & Glendon, 2003).

2.3 Statistical treatment of data:

Responses of the participants were primarily collected in an excel sheet and further processed using IBM SPSS program 26. A chi-square test for independence with $\alpha = 0.05$ was conducted to assess if gender (male, female) was related to blood group of an individual, and a two way multivariate analysis of variance was performed for five continuous dependent variables (Extraversion, Agreeableness, Conscientiousness, Neuroticism, Intellect). Gender (male, Female) and blood groups (A, B, AB, O) were two independent categorical variables. Normality of dependent variables was tested separately as there is no standard test for multivariate normality. Levene's test of equality of error variances was conducted to check the homogeneity of covariance matrices across the groups in MANOVA (Wu et al., 2005).

Results:

The internal consistency reliability for 10-items of each of five scales (Extraversion scale, Agreeableness scale, Conscientiousness scale, Neuroticism scale, Intellect scale) was judged based on the Average inter-item correlation (AIC) analysis and calculating cronbach's alpha. Two items of Extraversion scale and Agreeableness scale, found to correlate negatively with several other items within the scale, were deleted. To get equal number items in each of five scales, two items of each of remaining scales were also deleted. According to Clark and Watson (1995) recommending the desired AIC range to be 0.15 to 0.20

and most psychometricians agreeing with the notion that a cronbach's alpha value of 0.70 is acceptable, both the obtained AIC and alpha values for each of five scales were enough to prove the adequate internal consistency for the 8-items of these scale, although agreeableness scale is still under questions due to its alpha value (0.57) less than acceptable value (Islam, 2020) [Table 2]

Table 2
Average inter-item correlation(AIC) with minimum and maximum inter-item correlations and cronbach's alpha values

	AIC value	Alpha value
Extraversion scale	0.26 (0.05–0.5)	0.73
Agreeableness scale	0.16 (-0.13 -0.35)	0.57
Conscientiousness scale	0.34 (0.12–0.78)	0.80
Neuroticism scale	0.35 (0.08–0.70)	0.81
Intellect scale	0.24 (-0.17 -0.47)	0.74

The chi-square test was not statistically significant [χ^2 (3, N = 148) = 2.86, $p > 0.05$], indicating blood group of an individual was independent of gender.

A two way multivariate analysis of variance was performed to estimate the impact of gender and blood type on the five dependent variables: Extraversion, Agreeableness, Conscientiousness, Neuroticism, intellect. Normality test (Shapiro-wilk) of each dependent variable showed all dependent variables were normally distributed with exception in Extroversion ($p = 0.04$) and Agreeableness ($p = 0.03$) although histograms of all variables were with familiar bell-shape curve. Levene's test of equality of error variance was non-significant for all variables.

The two way multivariate analysis was interpreted using Pillai's trace (Box's M = 153.76, $p = 0.063$) as some assumptions were violated by this study. This test result showed gender had significant main effect on the combined dependent variable, [F (5,136) = 4.520, $p = 0.001$, $(1-\beta) = 0.967$, $\eta^2 = 0.143$], neither blood groups [F (15,414) = 1.102, $p > 0.05$] nor the interaction of blood type and gender [F (15,414) = 1.111, $p > 0.05$] had significant effect. Tests of between-subjects effects showed gender had significant main effect for neuroticism [F (1) = 10.253, $p = 0.002$, $\eta^2 = 0.068$, $(1-\beta) = 0.89$], intellect [F (1) = 6.392, $p = 0.013$, $\eta^2 = 0.044$, $(1-\beta) = 0.709$], and extraversion [F (1) = 7.875, $p = 0.006$, $\eta^2 = 0.053$, $(1-\beta) = 0.796$]. Pairwise comparisons of gender showed males scored significantly higher than females on Neuroticism (MD = 3.5), Intellect (MD = 2.1), Extraversion (MD = 2.6). Moreover, males scored numerically higher than females on Conscientiousness [(MD) = 0.9, $p > 0.05$] while Females scored numerically higher than males on Agreeableness [(MD) = 0.4, $p > 0.05$]. Observed power for the main effect of gender was averagely 53%, ranging from 10% (Agreeableness) to 89% (Neuroticism). [Table 3]

Table 3

Mean score (M), 95% confidential intervals, Mean difference (MD), significance level, effect size(2), and observed power(1-) for dependent variables (N = 148)

$\eta\beta$										
	Male		Female		MD		P ^a value	η^2	1- β	
	M	95% CIs	M	95% CIs						
Extraversion	14.5	13.3 15.8	11.9	10.6 13.3	2.6		0.006 ^b	0.053	0.81	
Agreeableness	22.7	21.8 23.7	23.1	22.0 23.9	-0.4		0.723	0.001	0.10	
Conscientiousness	19.4	18.1 21.1	18.5	17.1 19.9	0.9		0.388	0.005	0.14	
Neuroticism	16.1	14.5 17.4	12.6	11.1 14.1	3.5		0.002 ^b	0.068	0.89	
Intellect	19.1	18.1 20.3	17.0	15.8 18.2	2.1		0.013 ^b	0.044	0.71	
a. Adjustment for multiple comparisons: Bonferroni.										
b. The mean difference is significance at 0.05 level										

A series of post-hoc analysis (Scheffe) was performed to examine individual mean difference comparisons across all four blood groups and five personality factors. The result revealed that all post-hoc mean comparisons were statistically non-significant ($p > 0.05$). Post-hoc tests table showed blood group A individuals did higher score on Extraversion than other blood groups. On Agreeableness, blood group A individuals did higher score than blood group AB and O while did lower score than blood group B. Then again, blood group A had highest score on Conscientiousness and Neuroticism than blood group B and O while lowest score than blood group AB. On Intellect, blood group A had lowest score than all other blood groups.

Blood group B had highest score on Extraversion, Conscientiousness, Neuroticism compared to blood group O while lowest score compared to blood group A and AB. In addition, blood group B had highest score on Agreeableness and Intellect compared to all other blood groups.

Blood group AB had highest Conscientiousness score and lowest Neuroticism score compared to all other blood groups. This blood group individual had highest score on Extraversion than blood group B and O while lowest score than blood group A. Then again, blood group AB had highest score on Intellect compared to blood group A and O while lowest score compared to blood group B.

Blood group O had lowest score on Extraversion, Conscientiousness, Neuroticism compared to all other blood groups. This blood group individual had highest score on Agreeableness compared to blood group AB while lowest score compared to blood group A and B. Then again, compared to blood group A, blood group O had highest score on Intellect but had lowest score compared to blood group B and AB. Observed

power for the main effect of blood group was averagely 29.6%, ranging from 14% (Conscientiousness) to 44% (Agreeableness). [Table 4]

Table 4

Post-hoc tests results

Dependent variables (DV) with observed power, Blood group (I&J), Mean difference (MD), Significance value (p), 95% confidential interval.

DV	(I)	(J)	MD (I-J)	P value	95% CI	
					Lower Bound	Upper Bound
Conscientiousness Total (0.14)	A	B	.37	.993	-3.11	3.86
		AB	-1.18	.914	-5.79	3.44
		O	1.57	.652	-1.90	5.04
	B	A	-.37	.993	-3.86	3.11
		AB	-1.55	.802	-5.93	2.84
		O	1.20	.764	-1.96	4.35
	AB	A	1.18	.914	-3.44	5.79
		B	1.55	.802	-2.84	5.93
		O	2.75	.372	-1.63	7.12
	O	A	-1.57	.652	-5.04	1.90
		B	-1.20	.764	-4.35	1.96
		AB	-2.75	.372	-7.12	1.63
Neuroticism Total (0.38)	A	B	.39	.993	-3.28	4.06
		AB	-.50	.994	-5.36	4.36
		O	1.72	.621	-1.93	5.37
	B	A	-.39	.993	-4.06	3.28
		AB	-.89	.961	-5.51	3.73
		O	1.33	.733	-1.99	4.65
	AB	A	.50	.994	-4.36	5.36
		B	.89	.961	-3.73	5.51
		O	2.22	.603	-2.39	6.83
	O	A	-1.72	.621	-5.37	1.93
		B	-1.33	.733	-4.65	1.99
		AB	-2.22	.603	-6.83	2.39
Intellect Total (0.27)	A	B	-1.52	.522	-4.38	1.34
		AB	-1.00	.906	-4.79	2.79
		O	-.29	.994	-3.14	2.56

DV	(I)	(J)	MD (I-J)	P value	95% CI	
					Lower Bound	Upper Bound
	B	A	1.52	.522	-1.34	4.38
		AB	.52	.983	-3.08	4.12
		O	1.23	.617	-1.36	3.82
	AB	A	1.00	.906	-2.79	4.79
		B	-.52	.983	-4.12	3.08
		O	.71	.958	-2.88	4.30
	O	A	.29	.994	-2.56	3.14
		B	-1.23	.617	-3.82	1.36
		AB	-.71	.958	-4.30	2.88
Extroversion total (0.25)	A	B	.13	1.000	-3.07	3.34
		AB	.03	1.000	-4.22	4.27
		O	1.53	.605	-1.66	4.72
	B	A	-.13	1.000	-3.34	3.07
		AB	-.11	1.000	-4.14	3.93
		O	1.40	.603	-1.50	4.30
	AB	A	-.03	1.000	-4.27	4.22
		B	.11	1.000	-3.93	4.14
		O	1.50	.772	-2.52	5.53
	O	A	-1.53	.605	-4.72	1.66
		B	-1.40	.603	-4.30	1.50
		AB	-1.50	.772	-5.53	2.52
Agreeableness Total (0.44)	A	B	-.23	.994	-2.52	2.06
		AB	1.82	.411	-1.21	4.86
		O	.07	1.000	-2.21	2.35
	B	A	.23	.994	-2.06	2.52
		AB	2.05	.259	-.83	4.94
		O	.30	.983	-1.78	2.37

DV	(I)	(J)	MD	P value	95% CI	
					(I-J)	Lower Bound
	AB	A	-1.82	.411	-4.86	1.21
		B	-2.05	.259	-4.94	.83
		O	-1.76	.396	-4.63	1.12
	O	A	- .07	1.000	-2.35	2.21
		B	- .30	.983	-2.37	1.78
		AB	1.76	.396	-1.12	4.63
Based on observed mean						
The error term is Mean square (error) = 13.013						

No significant interaction effect of gender and blood groups was observed on five personality dimensions. However, on Extraversion, blood group AB male scored highest and blood group AB female scored lowest. On Agreeableness, blood group B and AB male did high and low score respectively. Then again, blood group AB male and O female did high and low score respectively on Conscientiousness and Neuroticism. On Intellect, blood group B male and blood group A female scored highest and lowest (Table 5). Observed power for interaction effect of gender and blood group was averagely 31.6%, ranging from 14% (Conscientiousness) to 60% (Intellect). [Table 5]

Table 5
Interaction effect of gender and blood group on five dependent variables (DV)
with observed power.

DV	Male		Female	
	Max	Min	Max	Min
Extraversion (0.23)	AB (16.9)	O (12.6)	B (12.6)	AB (11.4)
Agreeableness (0.17)	B (23.8)	AB (20.3)	B (23.3)	AB (22.4)
Conscientiousness (0.14)	AB (21.9)	O (18.1)	A (19.3)	O (16.7)
Neuroticism (0.44)	AB (19.6)	O (14.5)	A (14.8)	O (10.9)
Intellect (0.60)	B (20.8)	O (18.1)	AB (18.8)	A (14.8)
Max = Maximum mean score among four blood type (A, B, AB, O)				
Min = Minimum mean score among four blood type (A, B, AB, O)				

Discussion:

This present study suggested that there is no relationship between blood groups and personality traits. Interaction effect of blood groups and gender on personality traits was insignificant while gender wise difference in personality traits was significant.

The finding that personality trait is independent of blood groups is supported by several previous studies directing no relationship between blood groups and personality traits exists (Alsadi, 2020; Cramer & Imaike, 2002; Kumar et al., 2021; Rogers & Glendon, 2003). At the same time, this finding is opposed by some recent studies claiming that they obtained significant relationship between personality and blood groups (Sivaraman et al., 2018; Tsuchimine et al., 2015). For instance, Sivaraman et al., (2018) in a tertiary teaching hospital, Tamil Nadu, India studied 250 medical students with ages ranging from 17 to 29 years, using Eysenck's questionnaire. They found the Introvert behavior of AB blood groups significantly differ from other blood groups; the Extrovert behavior and Neurotic behavior of blood group AB significantly differ from O blood group and A & B blood groups respectively. Tsuchimine et al., (2015) studied 1427 healthy Japanese subjects with ages ranging from 18 to 69 years, using Temperament and Character Inventory (TCI). They reported that ABO blood group A had significantly higher Persistence score than other blood groups. This present study found that blood group AB and O had highest and lowest score on Conscientiousness and Neuroticism respectively ($AB > A > B > O$); blood group B and A had higher and lower Intellect score respectively ($B > AB > O > A$); blood group A and O had higher and lower Extroversion score respectively ($A > AB > B > O$); blood group B and AB had higher and lower Agreeableness score respectively ($B > A > O > AB$). But no significant differences in personality traits based on blood groups were observed.

As to explain the reasons behind this type consequences, personality traits are actually the most complicated phenotypes developed from the interaction of both gene and environment. It is better understood from the recent twin and adoption studies have suggested that both genetics and environment factors can jointly explain well the individual variation in personality traits (Plomin et al., 2018) cited by (Tsuchimine et al., 2015). However, there is approximately 50% chance of genetic materials influencing what personality traits a person will have (Tsuchimine et al., 2015). Not a single gene, multiple genes are involved in building personality traits (Wu et al., 2005). Among them, some genes particularly DBH (Dopamine beta hydroxylase) gene, COMT (Catechol-O-methyltransferase) gene, MAOA (Monoamine oxidase) gene are thought to have direct influence on the personality traits of an individual (Hobgood, 2011). Hobgood, (2011) in his research paper proposed a notion regarding possible linkage between ABO gene and catecholamine genes such as DBH gene, COMT gene, MAOA gene. The evidence of linkage existing between ABO gene and DBH gene was presented by a group of Japanese scientists although there was small effect size (Tsuchimine et al., 2015). Since if ABO gene has direct effect on personality traits has not been uncovered yet, it is therefore primarily thought ABO gene has indirect effect on the personality traits, which is obtained through a complex interaction between the ABO gene and the catecholamine genes (Tsuchimine et al., 2015). Behestian & Hasemi, R. & Rashidi, (2015) cited by Alsadi, (2020) noted in their research paper that personality is a complex mixture of traits, positions, conflicts and feelings which cause an interconnection with the environment. Besides, Some environmental factors such as life conditions, parenting style, socioeconomic status, season of birth,

cognitive ability etc. greatly influence the personality traits (Alsadi, 2020; Tsuchimine et al., 2015). Since the formation of personality traits is not completely free from environments or surroundings experienced by a growing individual, reaching out a conclusive statement that whether or not there is a relationship between blood type and personality traits will therefore be very difficult and cumbersome. To obtain the exact outcomes regarding if or not there is relationship between blood type and personality traits, the study should be conducted in a large scale, kept all potentially influencing environmental factors in consideration.

Gender-wise comparisons in personality traits revealed males scored significantly higher than females on Extraversion, Neuroticism, Intellect (Openness to experience). Female scored numerically (although not significantly) higher and lower than males on Agreeableness and Conscientiousness respectively. Unlike this present study showing males scored significantly higher on Neuroticism with 89% statistical power, some previous studies reported females score significantly higher than males on Neuroticism (Cramer & Imai, 2002; Rinieris & Christodoulou, G. N. & Stefanis, 1980) and some found no significant relation between gender and Neuroticism (Kumar et al., 2021), (Lester, D., & Gatto, 1987) cited by (Rogers & Glendon, 2003). Moreover, some studies mentioned that they did not find significant relationship between gender and Extraversion, which was not parallel with the statement of present study telling males score significantly higher than females on Extraversion with 81% statistical power (Costa, P. T., & McCrae, 1992; Feingold, 1994), (Marusic, Iris & Bratko, 1998) cited by (Rogers & Glendon, 2003). Marusic, Iris & Bratko, (1998) reinforce the finding that males score significantly higher than females on Intellect with 71% statistical power while Paul et al., (1992) and Feingold, (1994) found no relation between gender and Intellect. Some previous investigations reported that females score significantly higher than males on Agreeableness which is parallel with the finding of this study but could not approach at the significance level (Cramer & Imai, 2002; Kumar et al., 2021), (Rogers & Glendon, 2003). Besides, Cramer & Imai, (2002) cited by Rogers & Glendon, (2003) mentioned that females did score higher on Conscientiousness than males, which is inconsistent with the present study finding although finding was not significant. Interaction effect of gender and blood type on personality was not significant, which is supported by some investigations stating that they did not obtain any significant effect for gender and blood type with personality traits (Cramer & Imai, 2002; Wu et al., 2005). Rogers & Glendon, (2003) reported the absence of interaction effect of gender and blood type on neuroticism. In contrast, first study of de Mikusinski, E. B., & Omar de Urteaga, (1983) cited by Rogers & Glendon, (2003) reported that they found blood type O females scored higher than blood type A females on extroversion. Second study of them represented blood type A males and blood type O female as more extroverted while blood type O males as more introverted.

This present study showed that blood group is independent of gender. Previously it was indicated that blood group is independent of age and ethnicity (Patil et al., 2016). On the contrary, a past study found that blood group is not independent of gender (Cramer & Imai, 2002).

As to the strength of this study, participants were recruited randomly from all over the country, stayed apart from each other which subsided the intervention of a participant in responses of others as observed

in conference, seminar, or any program. Participants were provided enough time to think about themselves, helped them to give correct answers.

As to the limitations of this study, sample size was not so large enough. A pilot study was not conducted which could have assisted to check the reliability and consistency of the questionnaire before the final study. Participants selected their blood groups based on their own knowledge. No blood group tests were conducted to check the accuracy of self-reported blood groups but respondents were instructed to select the option “Don’t Know” if there any confusion.

Future study should be conducted with large sample size having equal number of male and female, taken all potential environmental, social, cultural factors in consideration. Blood groups of all participants should be tested to ensure the accuracy. Before performing final study, a pilot study should be conducted to certify that questionnaire is well assorted and justified to achieve acceptance.

Declarations

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Author’s Contributions: Tahsin Ahmed Rupok conceived and designed this study and performed all statistical analysis. Material preparation, Data collection were performed by Tahsin Ahmed Rupok, Bayezid Bostami and Sunandan Dey. Tahsin Ahmed Rupok drafted this article and Sunandan Dey along with Bayezid Bostami critically revised the article for overall improvement of the manuscript. All authors approved the manuscript for submission.

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Compliance with Ethical Standards

Conflicts of interest: The authors have no conflicts of interest to declare that are relevant to the content of this article.

Ethics of Approval: This research was conducted in accordance with the Biosafety, Biosecurity, and Ethical Clearance Committee of Rajshahi University, Rajshahi-6205, Bangladesh.

Consent to Participate: All respondents gave full informed consent to participate.

Consent for Publication: All respondents gave consent for their data to be used in publication.

References

1. Ahmadian, H., Jalili, A., & Sharifi, M. (2015). The relationship between the big five personality factors with blood types in Iranian university students. *Journal of Chemical and Pharmaceutical Research*, 7(5), 233–240.
2. Alsadi, R. (2020). *Personality Traits and Their Relationship with Blood Groups among of Palestinian University Students*. May. <https://doi.org/10.5923/j.ijpbs.20201002.02>
3. Behestian, F., & Hasemi, R. & Rashidi, Z. (2015). The Five Personality Factors over the Students with Four Blood Types. *Journal of Applied Environmental and Biological Sciences*, 5(8), 45–49. www.textroad.com
4. Costa, P. T., & McCrae, R. R. (1992). Revised NEO personality inventory (NEO-PI-R) and NEO five-factor inventory (NEO-FFI). *Psychological Assessment Resources*.
5. Cramer, K. M., & Imai, E. (2002). Personality, blood type, and the five-factor model. *Personality and Individual Differences*, 32(4), 621–626. [https://doi.org/10.1016/S0191-8869\(01\)00064-2](https://doi.org/10.1016/S0191-8869(01)00064-2)
6. de Mikusinski, E. B., & Omar de Urteaga, A. G. (1983). The blood group as a genetic determinant of personality types. *Interdisciplinaria*, 4(2), 153–166.
7. Diener, E., & Lucas, R. E. (2021). *Personality traits*. Noba Textbook Series: Psychology. <http://noba.to/96u8ecgw>
8. Feingold, A. (1994). Gender differences in personality. *Psychology Bulletin*, 116(3), 429–456. <https://doi.org/10.1037/0033-2909.116.3.429>
9. Furukawa, T. (1927). A study of temperament by means of human blood groups. *Japanese Journal of Psychology*, 2(4), 612–634.
10. Goldberg, L. R. (1992). The development of markers for the big-five factor structure. *Psychological Assessment*, 4, 26–42.
11. Hobgood, D. K. (2011). ABO group B is associated with personality traits through linkage disequilibrium with low activity dopamine beta hydroxylase. *Hypotheses in the Life Sciences*, 1–8.
12. Islam, A. (2020). *Calculating and Interpreting Cronbach's Alpha using SPSS*. https://www.youtube.com/watch?v=O2aiaVTcx_o&list=PLcbSS1yTFNfXWVS3NIGMkVBgAijz_vytl&index=41&pbjreload=101
13. Khaledian, M., Ahmadi-mehr, Z., Naseri, E., Khosravani, F., & Shoshtari, M. (2013). The Relationship of Five Personality Factors with the Feeling of Happiness among Students. *International Letters of Social and Humanistic Sciences*, 8, 43–48. <https://doi.org/10.18052/www.scipress.com/ilshs.8.43>
14. Kumar, A., Sarvottam, K., Vishwakarma, S., & Yadav, U. (2021). Blood group- and gender-wise comparison of big five models of personality among medical students. *National Journal of*

15. Lester, D., & Gatto, J. (1987). Personality and blood group. *Personality and Individual Difference*, 8(2), 267. [https://doi.org/10.1016/0191-8869\(87\)90184-X](https://doi.org/10.1016/0191-8869(87)90184-X)
16. Marusic, Iris & Bratko, D. (1998). Relations of masculinity and femininity with personality dimensions of the five-factor model. *Sex Roles*, 38, 29–44. <https://doi.org/10.1023/A:1018708410947>
17. Nahida, A., & Chatterjee, N. (2016). A study on relationship between blood group and personality. *International Journal of Home Science IJHS*, 2(21), 239–243.
<http://www.homesciencejournal.com/archives/2016/vol2issue1/PartD/2-1-54.pdf>
18. Patil, J., Kumar, N., Satyam, S. M., Kupusamy, K., Han, L. M., Rozan, R. B., & Gill, R. K. (2016). Influence of blood group on the character traits -A cross-sectional study on Malaysian student population. *Journal of Chemical and Pharmaceutical Sciences*, 9(2), 865–868. www.jchps.com
19. Paul, T., Costa, Jr and Robert, R., & McCrae. (1992). Four ways five factors are basic. *Personality and Individual Differences*, 13(6), 653–665. [https://doi.org/10.1016/0191-8869\(92\)90237-J](https://doi.org/10.1016/0191-8869(92)90237-J)
20. Pisk, S. V., Vuk, T., Ivezić, E., Jukić, I., Bingulac-Popović, J., & Filipčić, I. (2019). ABO blood groups and psychiatric disorders: a Croatian study. *Blood Transfusion*, 17(1), 66–71.
<https://doi.org/10.2450/2018.0266-17>
21. Plomin, R., DeFries, J., GE, M., & McGuffin, P. (2018). *Behavioral genetics 5th ed.* New York: Worth Publishers.
22. Rinieris, P. M., & Christodoulou, G. N. & Stefanis, C. N. (1980). Neuroticism and ABO blood types. *Acta Psychiatrica Scandinavica*, 61(5), 473–476. <https://doi.org/10.1111/j.1600-0447.1980.tb00885.x>
23. Rogers, M., & Glendon, A. I. (2003). Blood type and personality. *Personality and Individual Differences*, 34(7), 1099–1112. [https://doi.org/10.1016/S0191-8869\(02\)00101-0](https://doi.org/10.1016/S0191-8869(02)00101-0)
24. Sivaraman, S., Vijay, B., Ismail, M., & Thirumalaikolundu Subramanian, P. (2018). Personality Profile Among Different Blood Groups. *Journal of Evolution of Medical and Dental Sciences*, 7(28), 3166–3169. <https://doi.org/10.14260/jemds/2018/712>
25. Tsuchimine, S., Saruwatari, J., Kaneda, A., & Yasui-Furukori, N. (2015). ABO blood type and personality traits in healthy Japanese subjects. *PLoS ONE*, 10(5), 1–10.
<https://doi.org/10.1371/journal.pone.0126983>
26. Wu, K., Lindsted, K. D., & Lee, J. W. (2005). Blood type and the five factors of personality in Asia. *Personality and Individual Differences*, 38(4), 797–808. <https://doi.org/10.1016/j.paid.2004.06.004>