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No Tendencies of Personality Traits in Blood Groups: A Cross-Sectional Study

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Abstract

Background: Personality trait is a complex trait of an individual, which has been hypothesized to have link with diseases. It is believed that understanding personality traits of an individual can assist to prevent the diseases. Therefore, scientists are trying to explore potential factors that can predict the personality traits of an individual. Blood groups could be a potential predictor because some researchers have found a linkage between ABO genes and genes related to the development of personality traits in someone. Few studies have already found a significant relationship between blood groups and personality traits. However, there is still a paucity of researches to reach out a conclusion on this topic. Our study is another attempt to find out the possible relationship between blood groups and personality traits.

Method: The present study was a cross-sectional study which used a 50 items big-five factor personality inventory developed by Goldberg for data collection. A total of 148 participants responded to the study among them 85 participants were males and 65 were females. A two way multivariate analysis (MANOVA) was performed using IBM SPSS Statistics version 26.

Result: MANOVA results revealed 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. However, this study found a significant main effect of gender on the combined dependent variables [$F(5,136)=4.520$, $p=0.001$, $(1-\beta)=0.967$, $\eta 2=0.143$].

Conclusion: The present study did 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 was well-supported by this study.

Keywords: Blood Groups • Extraversion • Agreeableness • Conscientiousness • Neuroticism • Intellect

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 [1]. But till now, no scientific solidarity has been achieved with regards to this notion. Scientists have been searching the potential factors that can predict personality trait of an individual.

Personality trait is the reflection of the specific patterns of thoughts, feelings and behaviors of an individual, which is developed from the interaction of genetic material and environment [2]. Genetic materials explain 50% of the personality traits of an individual while environmental factors such as stressful life condition, parenting style, socio-economic status etc. explain the remaining thereof [3,4]. Multiple genes have guidance on the development of personality traits. However, exactly which genes are responsible is still under scrutiny [5]. Some catecholamine 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. On the other side, it was proposed that these catecholamine genes have a linkage with ABO genes [1,3]. Therefore, the theory of the possible linkage of Blood groups and personality traits is not irrational.

Moreover, blood groups are significant determinant of temperament, mental state and harmony with others [1,6,7]. They are also found to associate with certain diseases such as peptic ulcer, cancer, cardiovascular disease, stress response-related immune disease, smoking prevalence etc, [1,3,8]. In other words, these diseases are responsible to some extent for the development of psychological and mental problems such as depression, anxiety, sleep apnea etc. And, these psychological and mental problems having hereditary connection with blood groups are thought to arise from the weakness in personality building, which also suggest the possible tendencies of personality traits in blood groups [9].

Justification of the study instruments

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 [10,11].

Literature review

Review of some previous studies disclosed the inconsistent outcomes of the personality assessments. Some studies claimed they obtained significant relationship between blood groups and personality traits while

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some studies reported they did not observe any inclination of personality traits in blood groups. Cramer, et al. at the University of Windsor in Southwestern Ontario, Canada, studying 419 psychology undergraduates using 60-items NEO-PI, reported that they did not get any significant relation between blood groups and personality traits [12,13]. In the same year, Rogers, et al. came up with similar result but Unlike Cramer and Imaike, they used Goldberg, instrument [11] In Asia for first time, Wu et al. conducted personality assessment in a large scale with 2681 participants using Neuroticism Extroversion Openness Personality Inventory Revised (NEO PI-R). But the findings was same that they also did not found any relationship between personality traits and blood groups [5]. Nahida, et al. from India, reported that they did also find no correlation between blood groups and personality that is parallel to the outcomes described above. However, they used Eysenck's Personality Questionnaire Revised (EPQ-R) and sample size was small (N=100) [14]. Alsadi, at Al Istiqlal University, Jericho, Palestine, studied 337 physically healthy students using Eysenck Personality Inventory and found no relationship between personality and blood groups [9]. A recent study, conducted by Kumar, et al. using Neuroticism Extroversion Openness Five-Factor Inventory (NEO-FFI), reported the same results as mentioned above [8].

On the other side, Sivaraman, et al. 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 relationship between extrovert behavior and all blood groups [15]. Similarly, Ahmadian, et al. reported that they observed statistically significant inclinations of openness and extroversion in different blood types. But they did not obtain significant relationships of conscientiousness, neuroticism, agreeableness with different blood groups [16]. Tsuchimine, et al. [3] conducting personality assessment using Temperament and Character Inventory (TCI), reported that they observed a significant association between ABO blood group genotypes and personality traits. They showed blood group A had significantly higher Persistence than blood groups B and O.

As to describe the relationship between gender and personality traits, Cramer et al., Kumar et al., and Rogers et al. support the statement that personality traits of males significantly differ from that of females. For instance, Cramer and Imaike, reported that as compared to females, males score significantly higher on both Agreeableness and Neuroticism [8,11,12]. Alternatively, Kumar et al. reported that females comparatively score higher in agreeableness than males [8]. 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. reported no significant relationship between ABO genotypes and gender was found [3]. Besides, Rinieris, et al., and Lester, et al. reported the same result that no relationship found between gender and Neuroticism [17-19].

Knowledge gaps

From the literature review, it is obtrusive that there is still no scientific consensus whether personality traits are independent of blood groups or not because previous research outcomes were inconsistent with each other. Besides, compared to other fields, there is a lack of research papers on this field. No research paper was found from Bangladesh on the similar topic. Therefore, to the best of our knowledge, our study is first study Bangladesh aiming to find out the possible relationship between blood groups and personality traits.

Materials and Methods

Study objectives and questions

The present study objective is to find out the possible relationship between blood groups and personality traits. This study will find the answers of the following questions.

- What is the relationship between gender and blood groups of an individual?
- What is the impact of gender on the personality traits?
- What is the impact of blood groups on personality traits?
- What is the interaction effect of blood groups and gender on personality traits?

Participant and procedure

A web-based cross-sectional survey was carried out in Bangladesh using Goldberg, instrument during COVID-19 pandemic in 2021. The survey was continued for 20 days from March 1 to March 20, 2021. A Google form link was generated and shared with about 200 individuals through messenger, e-mail, what's app, etc. They were properly instructed how to complete the Google form of 50 items big five questionnaire. They were requested to choose blood group "Don't know" when there is any confusion regarding correct blood group. Moreover, they were informed about the data confidentiality and the reasons for collecting data. The participants having internet accesses, aged at least 18 years old, living in Bangladesh, having no physical trauma or mental problems, having no confusion about their blood group and having willingness to participate were included in this study. The participants falling out of these criteria were excluded from the study.

Instrument of analysis

A self-report big five inventory of 50 bipolar items developed by Goldberg was used for data collection, which was divided into five dimensions while each had 10 items [13]. 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.

The instrument was tested for reliability and validity. Cronbach's alpha of five dimensions based on our field data were extraversion (0.73), agreeableness (0.70), conscientiousness (0.80), neuroticism (0.81), and intellect (0.74). Our used instrument was reliable and valid as most psychometricians agree with the notion that a cronbach's alpha value of 0.70 is acceptable.

Statistical analysis of data

Responses of the participants were primarily collected in an excel sheet and then, processed and analyzed using Excel and IBM SPSS program. A chi-square test for independence with α=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, and 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 (Multivariate Analysis Of Variance) [5].

Results

Demographic information

Of all invited participants, 152 individuals responded with response rate 76%, 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. Relationship between gender and blood group of an individual.

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

Chi-square test was performed to confirm whether blood group is independent of gender. The chi-square test was not statistically significant [$\chi 2$ (3, N=148)=2.86, p>0.05], indicating blood group of an individual was independent of gender.

Impact of gender and blood groups on personality traits (Combined dependent variables)

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. Besides, 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-β)=0.967, η2=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.

Impact of gender on personality traits

Tests of between-subjects effects showed gender had significant main effect for neuroticism [F (1)=10.253, p=0.002, η2=0.068, (1-β)=0.89], intellect [F (1)=6.392, p=0.013, η2=0.044, (1-β)=0.709], and extraversion [F (1)=7.875, p=0.006, η2=0.053, (1-β)=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 2).

Impact of blood groups on personality traits

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) (Supplementary files (Tables S1-S3)). Post-hoc tests table showed following results.

Relationship of blood group a with personality traits: 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.

Relationship of blood group b with personality traits: 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.

Relationship of blood group ab with personality traits: 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.

Relationship of blood group o with personality traits: 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).

Interaction effect of gender and blood groups on personality traits

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 3). Observed power for interaction effect of gender and blood group was averagely 31.6%, ranging from 14% (Conscientiousness) to 60% (Intellect) (Table 3).

Table 2. Mean score (M), 95% confidential intervals, Mean Difference (MD), significance level, effect size (η2), and observed power (1-β) for dependent variables (N =148).

Extraversion	Male		Female		MD	p [a]value	η2	1-β
	M	95% CIs	M	95% CIs	-	-	-	-
	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	0.1
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	15.8-18.2	2.1	0.013[b]	0.044	0.71

Note: [a]Adjustment for multiple comparisons: Bonferroni; [b]The mean difference is significance at 0.05 level.

Table 3. 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)

Note: 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 also insignificant while gender wise difference in personality traits was significant.

Relationship between blood groups and personality traits

According to this present study, there is no relationship between blood groups and Personality traits. This finding is supported by several previous studies [8,9,11,12]. On the contrary, this finding is opposed by some recent studies claiming that they obtained significant relationship between personality and blood groups [3,15]. For instance, Sivaraman et al. reported that 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 and B blood groups respectively [15]. Tsuchimine et al. studied using Temperament and Character Inventory (TCI), reported that ABO blood group A had significantly higher Persistence score than other blood groups [3]. 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 all the outcomes mentioned above were statistically insignificant.

Personality traits are the most complicated phenotypes which develop from the interaction of both gene and environment. A recent study reported a similar finding that both genetics and environmental factors can jointly explain the individual variation in personality traits [20]. It was reported that genetic materials can influence 50% of personality traits of an individual [3]. Multiple genes are involved in building personality traits [5]. 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 [1] Hobgood, proposed about the possible linkage between ABO gene and catecholamine genes such as DBH gene, COMT gene, MAOA gene. This proposal was proved by a group of Japanese scientists although there was a small effect size [3]. Therefore, ABO gene might have a direct or indirect influence on personality traits. However, on the other side, personality is a complex mixture of traits, positions, conflicts and feelings which cause an interconnection with the environment [9,21]. Besides, some environmental factors such as life conditions, parenting style, socioeconomic status, season of birth, cognitive ability etc. greatly influence the personality traits [3,9]. As the formation of personality traits is not completely free from environments or environmental factors, therefore reaching out a conclusive statement whether or not there is a relationship between blood type and personality traits will be very difficult and cumbersome.

Relationship between gender and personality traits

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 on Neuroticism and some found no significant relation between gender and Neuroticism [8,11,12,17,18]. Moreover, some studies mentioned that they did not find significant relationship between gender and Extraversion, which was not consistent with our study reporting males score significantly higher than females on Extraversion with 81% statistical power [22,23]. Marusic, et al. reported that males score significantly higher than females on Intellect with 71% statistical power while Paul et al. and Feingold, found no relation between gender and Intellect [10,21,22]. Some previous investigations reported that females score significantly higher than males on Agreeableness which was parallel with our study but our finding could not approach at the significance level [8,12]. Besides, Cramer and Imaike, mentioned that females did score higher on Conscientiousness than males, which was inconsistent with our study [12].

Interaction effect of gender and blood groups

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 [5,12]. Rogers, et al. reported the absence of interaction effect of gender and blood type on neuroticism. In contrast, de Mikusinski, et al. reported that blood type A males and blood type O females are more extroverted while blood type O males are more introverted [24,25].

Relationship between gender and blood groups

This present study showed that blood group is independent of gender. Previously it was indicated that blood group is independent of age and ethnicity. On the contrary, a past study found that blood group is not independent of gender [12].

Conclusion

The present study found no relationship between blood groups and personality traits of an individual. Our study suggests that blood groups cannot be a single predict that can be used to project someone's personality traits. However, our study had some limitations that could significantly influence the study findings. Therefore, we will recommend that future studies should fulfil the limitations to present the findings more confidently.

Limitations and Strength

As to the strength of this study, participants were recruited randomly from all over the country. Participants were provided ample time to think about themselves which allowed them to give more justified 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.

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 and Shahnaz Parvin Sweety 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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Declarations

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Conflict of interest

None declared

Ethical approval

Not required

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