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Correlation between ABO Blood Groups and Proficiency in Computer Gaming

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ABSTRACT

In Human blood group systems, the ABO blood group is a most important system. Numerous studies have analyzed the possible correlation between ABO blood groups and different diseases and personality traits. This article examined the probable correlation between ABO blood groups and proficiency in computer gaming. From April 20017 to November 2017, a total of 146 subjects was analyzed. The results of a present study indicate a statistically significant correlation and suggest that individuals with group O have more proficiency in computer gaming. Female are less proficient in computer gaming than males. The correlation between ABO blood type and computer gaming is therefore suggested by this study.
KEYWORDS: Blood Groups, ABO blood grouping, Computer Games.

1. INTRODUCTION

Blood is a body fluid in humans and animals that carries elementary substances like oxygen and nutrients to the body cells and move metabolic wastage away from these cells. Plasma, red blood cells, white blood cells and platelets are the elementary components that comprise human blood. Blood is indispensable to life as there is no potential alternate to blood.
The human blood group system is a mechanism that categorized the blood on the presence or absence of particular markers. According to International Society of Blood Transfusion, 36 human blood group systems have been identified [1]. ABO is one of a common blood grouping system discovered by Karl Landsteiner in 1901. In ABO system, the classification of human blood is grounded on congenital properties of red blood cells as defined by the absence or presence of the antigens. The antigens belong to ABO blood group are associated to oligosaccharide chains at the surface of the erythrocyte membrane, and also on the surface of many other kinds of cell types like endothelia and epithelia. ABO gene is located at the band 9q34.2 and includes 7 exons. The ABO gene encodes three allele forms: A, B and O, which eventually combine to form four major ABO blood groups in humans (i.e., A, B, AB and O). Two antigens and two antibodies are mostly in authority for the ABO types. Table 1 describes the possible permutations of antigens and antibodies with the corresponding ABO blood type.

Table 1. Combination of Antigens and Antibodies in ABO Blood

ABO Blood Type	Antigen (A)	Antigen (B)	Antibody (anti-A)	Antibody (anti-B)
A	Yes	No	No	Yes
B	No	Yes	Yes	No
AB	Yes	Yes	No	No
O	No	No	Yes	Yes

The medical importance of the ABO blood group system expands beyond the transfusion and transplantation sciences and numerous reports have reported on the imperative association in the development of oncological, cardiovascular and other issues [2,3]. ABO blood types are not restricted to human, but also presents in animals like chimpanzees and gorillas [4].
Video games are the digital games and a kind of interactive multimedia and generally used for entertainment. Computer games are existed since the introduction of computing technology, and gain popularity and diversity with the expansion of computing technology. It was normally postulated that computer gaming has negative

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consequences on young players, yet petite evidence has appeared to support these claims. The computer games were initially developed for entertainment, yet in recent eras there has been an increase of concentration in the use of games for learning and behavioral variation [5].

Durkin and Barber in [6] reported a study which analyzed the relation between game playing and different measures of adjustment or risk taking on students. The study identified no negative impact on game players. The study resolved that computer games can be a constructive feature of a healthy adolescence.

Sylvén and Sundqvist [7], described that multiplayer online game delivers L2 English beginners with linguistically substantial and cognitively thought-provoking environment that may be helpful to L2 learning, because learner acquire different prospects for the input and interaction in the L2. Similarly, Kebritchi et al. [8], identified the impact of a computer game on students' mathematics accomplishment in public high school setting.

SimCity is a game developed for the simulation of city-building and urban planning. The game is available for multiple platforms and used the GlassBox as an engine. It allows the players to develop a settlement that may expand into a city by zoning land for industrial, commercial or residential development. Kim and Shin [9] analyzed the pedagogical benefits of SimCity and described that the use of SimCity can be a useful tool for learning geography.

In [10], the impact of using digital game and its role in increasing children's vocabulary learning was examined. In the treatment group, the SHAIEx game was used, whereas the traditional method was used in the control group to teach the English vocabulary. The study revealed that the use of digital game has a positive impact on teaching since the mean score of the subject in the treatment group was higher than those in a control group.

In [11], the effect of inference-based computer games on Chinese students studying English was investigated. The study reported that subjects learned more vocabulary in computer game condition than in the condition that follow the conventional study method.

The existing studies on the impact of using computer games in different discipline has shown mild results, but the reason of proficiency in gaming is still a less addressed area. The blood group has a strong association with different personality traits and medical diseases and therefore a decisive study is conducted which is based on the research question that whether a particular blood group affects the proficiency in computer gaming. The rationale of the study is to eliminate the gap in the literature related with elucidation of traits that affects the proficiency in computer gaming.

The trend of using computer games to support different areas has been increasing very rapidly but the varying level of proficiency in gaming has found in the gamer. This problem is virtually addressed in this article and the reported study would be significant in analyzing whether antigens and antibodies possibly affects the proficiency of computer games.

The rest of the paper is organized as follows. The related work is described in section 2 and the design & methods are included in section 3. Discussion is included in section 4. Finally, section 5 described the conclusion.

2. RELATED WORK

Several notable studies have been conducted to analyze the possible relationship between the blood groups and different diseases and capabilities.

In [12], 150 medical students are studied and their probable association between blood groups and bleeding time and clotting time are identified. The study reported that O blood group individuals have greater bleeding time and clotting time than the non-O blood group individuals. The study also observed that males had less bleeding time and clotting time than females.

Agari [13], analyzed the effect of blood groups on group participation. The study reported that subjects blood groups have an impact of their group cooperation and the A blood group holders have the highest inclination to group participation, followed by O, AB, B respectively. Similarly, in another study [14], the same kind of results is identified. The study identified that there is a positive and significant association between ABO blood groups and group participation, and the individual having A blood group has the highest group participations, and followed by O, AB and B respectively.

In [15], 1427 healthy Japanese subjects were analyzed and the association between the ABO genotypes or ABO phenotypes and personality traits were statistically examined by using multivariate analysis of covariance. The study identified a significant association between ABO group genotypes and personality traits on the analyzed subjects.

A study reported in [16] confirms the existence of a correlation of ABO blood groups with cholesterol level and coronary heart disease coronary artery disease and myocardial infarction. The study was conducted on 6476 Chinese subjects undergoing coronary angiography.

Iranfar and Letard [17] conducted a correlational study to elucidate the association between ABO blood groups and hypnotic susceptibility. The modified Hypnotic susceptibility form is used on a tiny sample and result identified that there is a strong correlation between ABO blood groups and hypnosis.

Gupta [18], explore the correlation between ABO blood groups and emotional intelligence by the analysis of 200 college students. The study indicated that individuals having AB+ blood group are higher on emotional stability and empathy, whereas the individuals having B+ blood group are higher on value orientation.

Atoom in [19], analyzed the association between ABO blood groups and the intelligence. During the study, 364 students of universities were tested. The study identified that AB blood group has the highest average in Intelligence Quotient test, whereas the B blood group has the lowest performance in the test results. In another study [20], the association between ABO blood groups and Intelligence Quotient in a particular region is identified. During the study, 263 subjects from rural area and 367 subjects from the urban area were selected. The study identified that in rural areas, males with blood group O have a high IQ level and similarly the females with a blood groups O have a high IQ level and the females with blood group B have low IQ level. In urban areas, the male subjects with O blood group have high IQ level and followed by the B blood group.
Running performance is known as a key driver of evolutionary benefit in humans, and keeping this view, Lippi et al. [21], analyzed whether the ABO blood groups have any effect on running performance. During the study, 52 middle-age athletes who are recurrently involved in endurance activity were selected. The study revealed that athletes with O blood group have better endurance as compare to the athletes with other blood groups.
Tuberculosis is a disease caused by Mycobacterium tuberculosis and affects the lungs. In [22], the association between ABO blood and pulmonary tuberculosis is examined on a particular geographical region. In the study, the treatment group comprised of 122 cases and control group comprised of 2842 cases. The study reported that A and B blood group individuals are more expected to suffer tuberculosis as compared to individuals with O and AB blood groups.
In [23], the possible correlation between ABO blood groups with blood pressure is analyzed. During study the 835 students were analyzed. The study identified that the individuals with A blood group have a high risk of heart diseases compared to other blood groups.
There are many other notable studies that investigated the impact of blood group type with personal traits and medical diseases. For more detail, see [24-28].

3. DESIGN & METHODS

In [29], Bleakley et al. reported a meticulous study conducted in the examination of literature on computer games and serious games in connection to the possible effects of gaming on the users, particularly on learning, skill enrichment and engagement. The study identified that playing computer games is associated with an array of cognitive, perceptual, social, affective and motivational effects and consequences. All these are naturally associated with the biological state of human and obviously with the blood group.
In order to explore the existing knowledge on the influence of ABO blood group system, a tiny study has conducted to identify the probable association between ABO blood groups and the proficiency in playing computer games.
This study population consisted of 146 recreational, young adults, computer literates (mean age: 22 ± 2 years), who normally play the computer games. The subjects for the study were selected by using stratified random sampling from the strata based on the ABO blood groups and categorized in four groups according to the blood groups of subjects. During the study it was endeavored to equalize the number of subjects (participants) in each blood group, yet the subjects in AB group are lesser than the other groups. The number of subjects in each group and their percentage in the total is shown in Fig. 1.

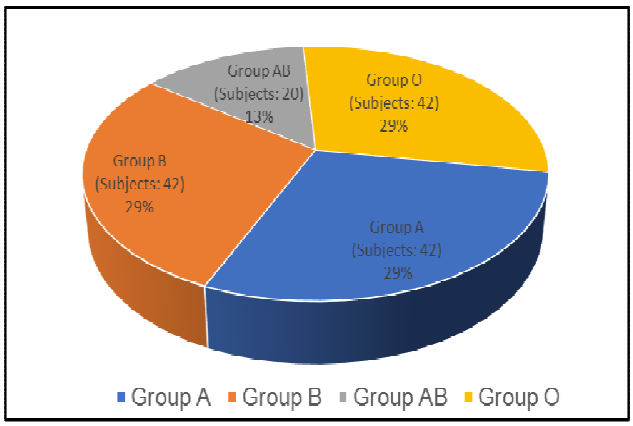

Fig. 1: Percentage Distribution of ABO in the Study

In three groups (A, B and O) the number of subjects was equal, whereas the AB group had a comparatively less number of subjects. Table 2 illustrates the detail of male and female participants included in the study groups.

Table 2. Detail of Subjects Participated in the Study

Subjects	Blood Groups			
	A	B	AB	O
Male	21	21	12	21
Female	21	21	8	21
Total	21	21	20	42

The study was started in April 2017 and completed in November 2017. All subjects voluntarily participated in the game. *Dave* is a one of a classic computer game and primarily used in a study to examine the possible association. This game is merely selected due to its simplicity and a fact that none of any subject in the study was acquainted with this game. Before examining all the stages and strategies of the game were practically demonstrated to all the participants and each participant was allowed to play the game three times before the formal evaluation. The results of formal evaluation are shown Table 3.

Table 3. Results of Formal Evaluation

Blood Groups	Win	Lose
A	13	29
B	17	25
AB	5	15
O	27	15

The winning percentage of four groups in the study were: 30.95% for group A, 40.48% in group B, 25% in group AB and 64.29% in group O, which indicates that winning ratio of O group is much higher than the other groups. For more and detailed analysis, a Chi-square test was conducted on the competency (win or lose) of the subjects in computer gaming. The results are shown in Table 6.

Table 4. Result of Chi-Square test

Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.028	3	.005
Likelihood Ratio	13.167	3	.004

As can be seen by the statistics tabulated in Table 4, there is a significant relationship between ABO blood groups and competency in computer gaming, $\chi^2(3, N=146) = 13.03$, $p < .05$.
To simplify the statistical analysis the score secured by participants in formal investigation are coded into the equivalent numbers ranged from zero to hundred and illustrated in Fig. 2.

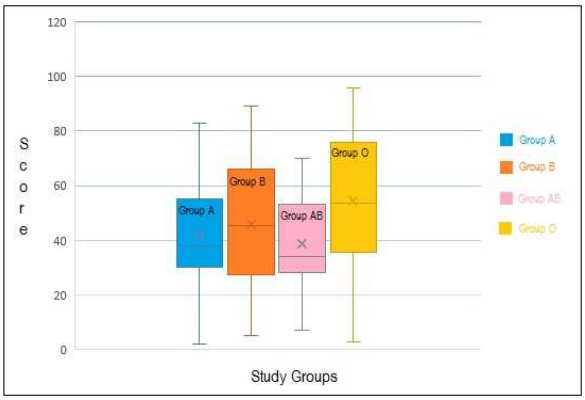

Fig. 2: Boxplot of score

The upper whisker and upper quartile of boxplots indicates that individuals in group O have secured more marks than the other groups. One-way ANOVA test is conducted on the coded score of the subjects in each group and descriptive results are shown Table 5.

Table 5. Descriptive Statistics of one-way ANOVA Test on the score of four groups

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
A	42	41.95	19.283	2.976	35.94	47.96	2	83
B	42	45.79	22.003	3.395	38.93	52.64	5	89
AB	20	38.80	19.256	4.306	29.79	47.81	7	70
O	42	54.50	24.511	3.782	46.86	62.14	3	96
Total	146	46.23	22.210	1.838	42.60	49.87	2	96

Among all groups the group O has highest mean score (54.50), and the subject with the highest score (96) also belonged to the blood group O. The result of one-way ANOVA showed that there was a statistically significant effect of ABO blood groups on proficiency in computer gaming remembered at the $p < .05$ for the conditions [(3, 142) = 3.370, p = .020].

The highest score in a game was secured by a male subject and therefore the proficiency of male subjects in all groups is evaluated by a one-way ANOVA test and the descriptive statistics are shown in Figure 6.

Table 6. Descriptive Statistics of one-way ANOVA Test on the score of male subjects of four groups

Group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
A	21	46.57	20.191	4.406	37.38	55.76	7	83
B	21	47.38	22.515	4.913	37.13	57.63	13	89
AB	12	43.00	19.278	5.565	30.75	55.25	7	70
O	21	68.19	18.343	4.003	59.84	76.54	32	96
Total	75	52.28	22.254	2.570	47.16	57.40	7	96

Among all groups the male subjects in group O have the highest mean score (54.50), followed by B, A and AB respectively. The result of one-way ANOVA showed that there was a statistically significant effect of ABO blood groups on the proficiency of male participants in computer gaming remembered at the $p < .05$ for the conditions [(3, 71) = 6.128, p = .001].

During study the difference between the performance of male and female subjects is analyzed with t-test by using the score of subjects in formal evaluation. The results are shown in Figure 7 and 8.

Table 7. Group statistics

Subjects	N	Mean	Std. Deviation	Std. Error Mean
Male	75	52.28	22.254	2.570
Female	71	39.85	20.438	2.426

The mean score of male participants (52.28) is much higher than the mean score of female participants (39.85), which indicates that male subjects are more proficient in computer games than the female subjects.

Table 8. T-test results

Assumption	Detail					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	3.511	144	.001	12.435	3.542	5.434	19.436
Equal variances not assumed	3.519	143.871	.001	12.435	3.534	5.450	19.419

The T-test conducted on the performance of subjects shows that there was a significant different score for male (M=52.28, SD=22.25) and female (M=39.85, SD=20.44) conditions; t(144)=3.51, p = .001.

4. DISCUSSION

The present study, evaluated the probable correlation between ABO blood types and proficiency in computer gaming. The total of 146 subjects (young adults) voluntarily participated in this study. The statistical significance of chi-square test conducted on the performance of individuals in gaming suggest that subjects with group O have better performance than the other groups. Similarly, the male subjects with group O have better performance than the other groups. The t-test conducted on the performance of male subjects revealed that female had less gaming proficiency in gaming than male. The reason for this vulnerability is not known.

On the whole the study implicitly suggests that the antigens and antibodies are not only related with blood cells and significant in blood transfusion, but they have many other biological and other significances and that need to be formally examined in further studies.

The finding of the current study may provide additional support to the putative evolutionary benefits of having the particular blood group. Moreover, the divergent kind of association in this article may motivate the other scholars to investigate the probable correlation of ABO blood groups and the comprehension of different domains like parsing [30] and programming [31-33].

5. CONCLUSION

The association between ABO blood type groups and human traits has no scientific consensus on the findings yet many studies statistically correlate ABO blood groups with different personality traits and medical diseases. In this article a study is reported that analyzed the probable association between the ABO blood group and proficiency in computer gaming on a small number of healthy subjects. The study suggested than individuals with blood group O have more proficiency in computer gaming and males are more proficient than females.

During study the subjects selected from Quetta, Pakistan were considered, so the finding of this article may not infer the subjects of other regions. The size of sample and the single region for the study are the main limitations of a study. To further expand the study in future, the following issues should be considered. First, it is fruitful to statistically analyze the impact of ABO blood on a large sample of different population. Second, various studies regarding the impact of ABO blood groups on human body and proficiency in computer gaming should be formally correlated by considering the biological aspects of antigens and antibodies. Third, the identification of other factors of human that may affect the proficiency of computer gaming should be considered. Fourth, correlating ABO blood groups with proficiency in computer gaming by allowing subjects to play different kinds of games in different environment. Sixth, the identification of academic, commercial, social and cognitive, pros and cons of proficiency in computer gaming.

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