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Blood types and fitness capability of physical education students: a non-parametric analysis

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Authors Contributions: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection.

Abstract

Background and Study Aim: The study describes the association of blood types and physical fitness capability of physical education students.

Material and Methods: A non-parametric analysis was used in the study employing chi-square with the Cramer's V analysis to provide the likelihood relationship between variables. Using the simple random sampling, there were 263 participants composed of 198 (75.3%) females and 65 (24.7%) males. The samples were all students from physical education subject with the age ranged from 17-34 years old.

Results: The finding showed that among the physical fitness capability of the PE students, only anaerobic and flexibility fitness have positive association to blood types. Further, anaerobic fitness has the likelihood to be more advantageous within the A blood type with 57.1%. While flexibility fitness is seen in blood type O with a likelihood association of 79.1%, A with 60.7%, and B 55.3%. Moreover, this implies that PE students' physical fitness capability such as anaerobic and flexibility fitness are potentiality associated or related to blood types most specifically to "A" and "O." Thus, in any fitness related physical activity, blood type must be considered in the selection process especially if instills high intensity exercises producing without oxygen and muscle range extension.

Conclusions: It has been concluded that physical fitness capability of an individual can be attributed or influenced by the type of blood he/she possesses. Thus, in the context of sports and dance competition that requires specific physical fitness level, it is recommended to consider blood types of a person.

Keywords: blood types, fitness capability, physical education, non-parametric analysis

Introduction

Physical activity has been the venues for developing and promoting fitness of the individuals. Thus, physical fitness is always been linked to individuals' capability to perform physical activity [1] and some studies relate it to selective attention and concentration [2, 3, 4]. However, not all individual is capable in engaging and performing in any physical activity. Oftentimes, comparison between individuals in terms of capability in performing physical activity can easily be uttered and/or identified by others. Usually, the reasons behind it can be seemingly associated to "it runs from the blood" and "it's an innate talent". Thus, it somehow elaborates the relationship of blood types and physical fitness capability in engaging in physical activity.

During COVID – 19 pandemics, there are studies that had proven that physical fitness level of an individual increase specifically on the body mass index, flexibility, cardiovascular endurance, muscular endurance, and strength in performing home quarantine – based rhythmic exercises [5] and housework – based exercise (household chores) and conventional exercise program given to the young adults [6]. Even before pandemic, there are several studies already proved that physical fitness of an individual can be augmented if certain interventions will be provided and/or facilitated. It has showed that students' participation in physical activity increases its fundamental movement skills [7] and when there are physical resources provided, internal regulation is clear, students' intentions is strong and when they feel supported and motivated [8].

However, there is a dearth in study that can explain the relationship and/or association between blood types and physical fitness of the students. Most of it were just implied studies. Such as blood types are usually associated to personality and IQ of a person [9, 10]. Recently, there is a study that proves the relationship between blood types and movement capability in physical activity. It was explained that blood type is a predictor of movement capability in terms of flexibility, speed, accuracy, and endurance of an individual [11]. Moreover, another study explained that people with blood type "O" and positive RH have the higher risk or chance in terms of increasing his/her body mass index (BMI) [12]. Though, the level of association were not thoroughly elaborated in the above studies. Thus, this study is eager to understand the link between the two variables and provide more evidences on its relationship.

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Materials and Methods

Participants

Using the simple random sampling technique, there were 263 participants composed of 198 (75.3%) females and 65 (24.7%) males. The samples were all students from physical education subject with the age ranged from 17-34 years old. The participants are all physical education students in one of the medical universities in Cebu, Philippines.

Research Design

The study utilized a non – parametric descriptive research design. Descriptive was used to describe the students' age, gender, and blood types. Moreover, it explained and described the level of fitness capability of the students in terms of the flexibility, aerobic, speed, agility, anaerobic, and power. In the same vein, Chi - square and Cramer's V were employed to surface the potential likelihood of blood types to fitness capability of the students. Valid instruments were used in the study. First part of the instrument is the profile and blood classification of the students. While, the second part of the instrument are the series of fitness tests that are commonly used by the PE instructors in the university to test the students' fitness capability level. This instrument has been used by PE instructors of the university in many years. The different tests were adopted from the American College of Sports Medicine [13] for registering baseline fitness capability of students and these tests were used in many researches such as 12-minute run for aerobic fitness [14], 40-yard sprint for speed fitness [15], 300- yard shuttle for anaerobic fitness [16], hexagon test for agility fitness [17], vertical jump for power fitness [18], and sit and reach for flexibility fitness [19]. Moreover, these tests have been indigenized by PE teachers to be more applicable in the context of Filipino skill test. Indigenization of the instruments happened during the giving of the instructions of the concept of the test, using the language wherein the participants can understand fully the test, few of the materials or equipment for the test were modified based on the availability of the school's materials (e.g., instead of sports pistol, whistle was used), and the setting of the test were slightly modified.

Statistical Analysis

Microsoft word excel was used in storing and analyzing of the data. Descriptive statistics were used in the profile, blood types and fitness capability levels of the participants. Then, chi-square with the Cramer's V analysis to provide the likelihood relationship between variables.

Results

Below are the results of the study presented in tables.

Table 1. Profile of the Participants (n=263)

Variable	Category	Frequency	Percentage
Age	17 years old	4	1.5
	18 years old	117	44.5
	19 years old	128	48.7
	20 years old	10	3.8
	21 years old	2	.8
	24 years old	1	.4
	34 years old	1	.4
Sex	Male	65	24.7
	Female	198	75.3

Table 1 presents the profile of the participants in terms of age and sex. It can be observed that the participants of the study were mostly 19 (48.7%) and 18 (44.5%) years of age. This is so, since they are all tertiary (1st year) students in a private university of Cebu, Philippines. It is believed that this age range (young adults), their engagement in physical activity have greatly diminishing or declining [20]. Further, the participants are mostly female (75.3%) which according to the study that women are greatly influenced by their parents in terms of the engagement in physical activity [21].

Table 2. Participants' Blood Types

Blood Category	F	%
Blood Type "A"	46	17.50
Blood Type "B"	77	29.27
Blood Type "AB"	43	16.35
Blood Type "O"	97	36.88
Total	263	100

Blood Type has been analyzed using frequency and percentage distributions. It has been revelled in Table 2 that among the 263 participants, the sample has been mostly composed of those who belong to "O" blood type, f=97, 36.88%. This has been marginally followed by the Blood Type "B" group, f=77, 29.27%. A lesser distribution of the sample composed blood types "A" and "AB", f=46, 17.50% and f=43, 16.35%, respectively. Apparently, in the Philippines blood type "O" and blood type "A" are the dominating blood categories among the Filipino people [22].

Table 3 presents the descriptive analysis of the participants in terms of their physical fitness capability. In terms of their flexibility fitness level, it has been indicated that most of the participants have a very good capacity to extend their range of motion in performing the flexibility test with a mean of 73.68 and standard deviation of 15.09. This further implies that the participants' flexibility fitness capability at the start of the study is already high. Power on the other hand, posited a below average

Table 3. Descriptive Measures of the Physical Fitness Capability of the Participants (n=263)

Fitness Component	M	SD	Interpretation
Flexibility	73.68	15.09	Very Good
Power	36.22	14.61	Below Average
Agility	36.45	7.32	Excellent
Speed	7.51	2.01	Poor
Anaerobic	15.99	6.09	Below Average
Aerobic	1476.99	358.45	Poor

Table 4. Chi – square Analysis between the Blood Types and Physical Fitness Capability

Variable	Computed Chi – square	df	p-value	Significance	Result
Blood Type					
Aerobic	9.248	12	.682	Not Significant	Accept Ho
Speed	9.104	12	.684	Not Significant	Accept Ho
Agility	10.174	9	.337	Not Significant	Accept Ho
Anaerobic	22.704	12	**.030**	Significant	Reject Ho
strength	15.862	18	.602	Not Significant	Accept Ho
Flexibility	21.645	12	**.042**	Significant	Reject Ho

result with a mean of 36.22 and standard deviation of 14.61. This means that the participants' capability to resist resistance in lifting heavy objects displayed low level. While, participants in terms of their agility signifies excellent result with a mean of 36.45 and standard deviation of 7.32. This can be indicated that participants of the study have self – acquired efficiency in terms of body coordination while moving. However, participants' speed yielded poor result with a mean of 7.51 and standard deviation of 2.01. The result implies that the participants have low level in terms of movement displacement that requires time and distance. Similarly, in the account of anaerobic fitness level of the participants, it can be interpreted that the result is below average with a mean of 15.99 and standard deviation of 6.06. The result implies that at the start of the study, participants are not good in high intensity interval training and/or exercise that does not required so much oxygen. Lastly, the participant's aerobic fitness level is interpreted as poor with a mean of 1476.99 and standard deviation of 358.45. This can be interpreted that the participants at the start of the study cannot endure prolonged displacement of movements with respect to time. Overall, the participants fitness capability varies in the different fitness components that might have affected the results of the association between two variables.

Table 4 presents the association of blood types to the physical fitness capability of the participants in physical activity. Among the 6-fitness capability, only two (2) components were associated to blood types. It was found out that anaerobic fitness capability is associated to blood type with p - .030. Anaerobic fitness are exercises or physical activity that requires high intensity training and does not need too much oxygen in producing body movements. Some examples of anaerobic physical activity are weightlifting, jumping, sprinting, and biking. While, flexibility, on the other hand is the extent of the range of motion to reach in the next step, showed a good association with blood type with the p - .042. Some of the flexibility physical activity are gymnastics, ballet, dancing, and other activities the uses the extension of muscles or muscle groups.

The table 5 explains the likelihood ratio analysis of each of the blood type to fitness capability specifically on anaerobic fitness in physical activity. It was shown that blood type "A" is likely has the most potential in anaerobic fitness component which has 57.1% likelihood ration which is interpreted as above average. The result reveals that among the 4 types of blood, blood type "A" has the highest attribution or association to anaerobic fitness capability.

The table 6 shows the likelihood ration of blood type to fitness capability specifically on flexibility fitness component. Blood type O has the highest likelihood ration of 79.1% which is interpreted above average and followed by A (60.7%) and B (55.3%). It explains that blood type O is the most flexible among the blood types. Flexibility is described as the movement range of a person which can be commonly seen in some exercises such as splits, bridge stand, one- leg stand, high kicks and many more.

Discussion

The association of blood type and physical fitness capability is not been explored based on the literature review of the study. Physical fitness is

Table 5. Likelihood Ratio Analysis of Blood Type to Anaerobic Fitness Capability

Chi-square 26.240, p-value .010, Likelihood value 27.340, p – value .007	Anaerobic					Total
	P	BA	A	AA	E	
Blood Type						
A						
Count	5	0	4	16	3	28
% within Blood Type	17.9	0	14.3	57.1	10.7	100
% within Anaerobic	21.7	0	10.5	35.6	12.0	19.4
B						
Count	5	9	14	9	10	47
% within Blood Type	10.6	19.1	29.8	19.1	21.3	100
% within Anaerobic	21.7	69.2	36.8	20.0	40.0	32.6
AB						
Count	7	2	9	4	4	26
% within Blood Type	26.9	7.7	34.6	15.4	15.4	100
% within Anaerobic	30.4	15.4	23.7	8.9	16.0	18.1
O						
Count	6	2	11	16	8	43
% within Blood Type	14.0	4.7	25.6	37.2	18.6	100
% within Anaerobic	26.1	15.4	28.9	35.6	32.0	29.9
Total						
Count	23	13	38	45	25	144
% within Blood Type	16.0	9.0	26.4	31.2	17.4	100
% within Anaerobic	100	100	100	100	100	100

mostly associated to cognitive function [23], body composition indices [24], movement capability [11], academic performance [25, 26], self-control [27], and school and neighbourhood [28]. While, blood types were associated to stress [29], personality [10], cognitive impairment and dementia [30], behavior [31], and career development and organizational practices [32]. Thus, the study explained the association of the two variables and provided evidences to support the claims.

In terms of the distribution of blood type among the participants in Table 2, most of them are in blood type "O". Identifying the blood type of the participants had been carefully selected in the study so that there are enough representations of the different blood types. Further, to directly explain its association to the physical fitness capability of the participants. However, Philippines is dominantly blood type "O" and "A" [22]. Further, it is not only in the Philippines that "O" blood type is prevalent but also worldwide [33]. It is believed that this blood type has the potential in fighting against human pathologies [34], such as cancer [35], cardiovascular disease [36], diabetes [37], and venous thrombosis [38]. Thus, the representation of blood type "O" in this study might have affected the results of the study. However, this can be considered as the limitation of the study and a new area or topic for research.

Subsequently, Table 3 presents that the participants differ in their physical fitness capability in terms of the 6-fitness components as their baseline assessment in their fitness level. In the physical fitness capability, 4 out of six components such as power, speed, aerobic, and anaerobic are in poor level while 2 out of six components such as flexibility and agility are in high level. This implies that the participants of the study are more flexible and agile. Flexibility is the extent of the range of motion to reach next step while agility projects strong body coordination with respect to time [39]. Moreover, the participants of this study are likely to be capable on exercises that requires stretching, muscle extension, exhibiting sequencing, fractionating, and isolating their movements in the selective capacity.

In the Chi – square analysis of the association of blood types and fitness capability of the participants as presented in Table 4, it was found out that among the six (6) physical fitness components only anaerobic fitness and flexibility fitness were associated to blood types. Anaerobic fitness capability of the participants is significantly associated to blood type with p-.030. Anaerobic exercise is defined as a very short duration but intense physical activity and been fuelled and independent on inhaled oxygen

Table 6. Likelihood Ratio Analysis of Blood Type to Flexibility Fitness Capability

Chi-square 31.460, p-value .002, Likelihood value 30.506, p – value .002	Flexibility					Total
	P	BA	A	AA	E	
Blood Type						
A						
Count	1	0	9	17	1	28
% within Blood Type	3.6	0	32.1	60.7	3.6	100
% within Flexibility	50.0	0	18.4	20.2	100	19.4
B						
Count	1	2	18	26	0	47
% within Blood Type	2.1	4.3	38.3	55.3	0	100
% within Flexibility	50.0	25.0	36.7	31.0	0	32.6
AB						
Count	0	5	14	7	0	26
% within Blood Type	0	19.2	53.8	26.9	0	100
% within Flexibility	0	62.5	28.6	8.3	0	18.1
O						
Count	0	1	8	34	0	43
% within Blood Type	0	2.3	18.6	79.1	0	100
% within Flexibility	0	12.5	16.3	40.5	0	29.9
Total						
Count	2	8	49	84	1	144
% within Blood Type	1.4	5.6	34.0	58.3	.7	100
% within Flexibility	100	100	100	100	100	100

as an energy source in performing physical activity [40]. Sprinting, power lifting, high-intensity interval training and others are examples of anaerobic fitness exercises. In engaging in anaerobic exercises allows the increase in lactate and metabolic acidosis in the body [41]. It is believed that anerobic exercises can benefit the cardiovascular system of the body and decrease cardiovascular diseases [42]. Moreover, anaerobic exercise has positive influence on lipid profile and effective for weight loss [43]. The association of anaerobic fitness to blood type implies that performance in HIIT physical activity can be influenced by the types of blood the person possesses. Thus, physical activity that involves anaerobic fitness such as in sports competition, blood types must be considered.

Flexibility, on the other hand, is the capability of the body to extent in certain range of motion (ROM). Engaging in flexibility exercises prevent the chance of getting injury, correct muscle imbalances, develop good posture, and increase the joint range of motion [44]. Further, long - term engagement in flexibility/stretching exercise allows long – term muscle elastic changes which in a way increases the range of motion and decreases muscle – tendon injury [45]. Moreover, regular stretching/ flexibility either before or after an exercise elevates the maximal voluntary contraction, contraction velocity, eccentric and concentric contraction force, counter-movement jump height, and 50-yard dash time of the individuals [46]. With the positive association of flexibility to blood type with p-0.042, it implies that flexibility capability of an individual can be attributed to blood type. Thus, in physical activity engagement that involves flexibility, blood type of a person must be considered especially in sports and dance competitions.

Table 5 presents the likelihood ratio analysis of blood type to anaerobic fitness capability of the participants. Among the blood types only "A" blood type is associated to anaerobic fitness of the participants with the likelihood ration of 57.1%. Though, the likelihood ration is not that high but it is enough to show its positive relationship. It might be also that at the baseline assessment of the participants in terms of their level of anaerobic fitness is below average *(M=15.99, sd=6.09)* that has affected the viability of the association. There might be changes in the association if the baseline assessment of the participants on anaerobic fitness is high. This will be another area to be explored particularly on its fitness level. Moreover, this association implies that individuals with blood type "A" has the potential to excel in exercises or physical

activities that requires intense but short duration physical activity such power lifting, sprinting, and other high – intensity interval training exercises. This further implies to the sporting events, that choosing athletes that requires anaerobic exercises such weight lifting, sprint, long jump, javelin throw, discus throw, cycling and many others, blood type "A" must be considered.

On the other hand, flexibility fitness capability is associated to blood type "0" with the likelihood ration of 79.1%, blood type "A" with 60.7%, and blood type "B" with 55.3%. The results present that most of the blood types are associated to flexibility except for blood type "AB" with the likelihood ration of 26.9%. In the distribution of participants in terms of blood type, blood type "AB" had the lowest participation among the participants. This might be the cause why it does not show good association to flexibility fitness. Thus, this is also considered as the limitation of the study. However, it is clearly shown in the results that the viability of the relationship or association of blood type "O" to flexibility fitness capability of the participants is indeed very high. In other studies, it was explained that blood type "O" excels in endurance performances such as running event and believed to have a strong survival instinct than other blood types [47]. Further, "O" blood type is believed to have a better association to concentration index in the performance of sports [48]. Thus, the study proves that blood type "O" individuals potentially have the edge and ease in performing physical activity that requires extension of joint muscles and/or stretching. Being flexible allows individual to prevent muscle injury and have sense of good balance and posture. This indicates that the capability of the individuals most specifically those with blood type "O" can be seen to excel in physical activities either in sports or dance such as gymnastics, diving, surfing, combative sports, figure skating, dance, cheerleading, pole vaulting, skiing, etc. Further, selecting players or athletes that requires flexibility, blood type "O" must be considered.

The study provides significant explanation on the relationship or association of blood types to physical fitness capability in performing physical activity. Though, not all fitness capability were associated to blood type but it provides good grasp of understanding and knowledge that blood type can be a determining factor in the fitness capability of an individual in performing physical activity especially on an anaerobic and flexibility fitness capability. Further, this can somehow elaborate that the capability of an individual in performing physical activity can be traced and attributed to blood types.

Conclusions

It has been concluded that physical fitness capability of an individual can be attributed or influenced by the type of blood he/she possesses. Thus, in the context of sports and dance competition that requires specific fitness level, it is recommended to consider blood types of a person.

Conflicting Interest

There is no conflict of interest among the authors.

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