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EFFECTS OF EXERCISE AND GAME ON BOY'S PHYSIOLOGY AND SALIVARY ANTIOXIDANT PROPERTIES

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ABSTRACT

Background: This experiment was conducted to determine the exercise effects on anthropometric parameters and salivary antioxidant properties in boys. **Material and methods:** Saliva samples were collected from fourteen clinically healthy boys (for exercise-07 and game-07 boys). The body temperature, pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP) were measured before the exercise and the game as anthropometric parameters. FRAP and DPPH levels were evaluated as the antioxidant parameters of all the saliva samples. **Results:** Results of two groups' viz. exercise and game showed the significantly ($p<0.05$) increased level of temperature, pulse rate, SBP, and DBP after the workout and game except for the insignificant ($p>0.05$) increase of pulse rate in the exercise group. Overall anthropometric parameters showed that exercise and game caused physiological stress. Total antioxidant power and total antioxidant scavenging activity were significantly higher after the workout and game. **Conclusion:** Therefore, from this study, it might be concluded that salivary antioxidant property was changed due to the produced stress after exercise and the game. Meanwhile, in stress, saliva may be useful as the stress biomarker. In the future, the study should be conducted on a large number of volunteers for the changes in the composition of salivary in a different time period of stress due to exercise and game.

KEYWORDS: Antioxidant, DPPH, exercise, FRAP, saliva.

INTRODUCTION

Experimental research indicates that exercise and game has a great role in the development of the normal health of human beings.[1,2] But, prolonged exercise may affect health. Studies showed that metabolic stress might increase due to prolonged exercise. Several defense mechanisms of the body attenuate the evolved stress. Body fluids like serum and saliva have the several molecules which are responsible for the reduction of stress. Human saliva is the substantial fluid discharged from salivary glands. Saliva contains 99.5% water plus electrolytes, mucus, epithelial cell, (from which DNA can be extracted), enzymes (such as amylase and lipase), anti-microbial agents, etc.[2] Saliva has several molecules and enzymes like uric acid, aldehyde dehydrogenase, salivary peroxidase, etc., which are the biomarker for different inflammation.[3-5]

A lot of studies on different disorders like Head and neck cancer,[6] malignant ovarian tumors,[7] breast cancer,[8] dengue,[9] HIV,[7] cardiovascular diseases,[10] metabolic syndrome[11] indicated that saliva has the antioxidant properties. No studies have yet conducted to determine the effects of exercise and game on the human anthropometric parameters and consequent changes of salivary antioxidant activity. Therefore, this study was planned to evaluate the impact of exercise and sports on physiology and salivary antioxidant properties in boys.

MATERIALS AND METHODS

Study site and experimental design

This study was conducted at the Arni University campus, Himachal Pradesh, India, in 2019. For this study, boys were who has no account of metabolic problems like thyroid dysfunction, cardiovascular disease, diabetes, eating disorders, an inflammatory disorder, etc. All the individuals took part voluntarily in this experiment. All the participants were formed with a consecutive series. 20.43±0.65 year was the average age, 5.80±0.04 ft was the average height, and 63.53±2.58 kg was the average weight of seven boys who took part in the exercise (exercise in the gymnasium) experiment. 21.29±0.89 year was the average age, 5.63±0.06 ft was the average height, and 60.11±3.09 kg was the average weight of seven boys who took part in the game (cricket) experiment. The boys did gymnasium exercise for one hour, and another group of boys engaged them for three hours for a cricket match.

Measurement of anthropometric parameters

Before starting the exercise and cricket game, the height of all the fourteen individuals was measured by using measuring tape. Bodyweight was measured by using a weighing balance machine. The temperature was measured by the digital electronic thermometer with a heat sensor. Blood pressure (BP) meter (Omron automatic blood pressure monitor NANZ A-31) was used to measure the blood pressure of all the subjects. The pulse rate was calculated while measuring blood pressure by BP meter (NANZ A-31). All the volunteers were aware of the normal level of all these anthropometric parameters.

Saliva collection

By spitting method, saliva was collected in the sample collection tube before and after the cricket game of one group as well as before and after the gymnasium exercise of another group. After collecting the saliva, the entire sample was stored in the deep freeze (-80°C) until the analysis of the antioxidant parameters. All the participants were a postgraduate student at the university. They were previously aware of the saliva collection method and preservation.

Analysis of antioxidant parameters

For antioxidant parameter analysis, DPPH,[12] and FRAP[13] were executed. The entire test was performed in a triplicate test series. All the participants had a discussion class about these methods and the utility of all these methods.

Statistical analysis

We selected seven boys in the exercise group and seven other boys from the cricket match group. We did so as per the standard statistics method to choose a minimum of six experimental subjects. Statistical analysis was performed using SPSS version 22.0. All the data set has been executed for the 't'-test. The level of significance was determined at $p<0.05$.

RESULTS

Anthropometric Parameters

Results of two groups' viz. exercise and game showed the significantly ($p<0.05$) increased level of temperature, pulse rate, SBP, and DBP after the exercise and game except for the insignificant ($p>0.05$) increase of pulse rate in the exercise group (Table 1 & Table 2). Before the game, the average body temperature was 36.02 ± 0.21°C. Then after the game, it was changed to 37.58 ± 0.16°C, and this increase of body temperature was significantly ($p<0.05$) higher after the game than the before game condition (Table 1 & Table 2). Whereas, in the exercise group, the average body temperature before exercise was (36.03 ± 0.22°C) significantly ($p<0.05$) lower than the after exercise (37.35 ± 0.22°C) condition (Table 1). The pulse rate of the individual who played the cricket had significantly ($p<0.05$) higher PR after the game (96.43 ± 4.82 beats/min) than the before game (81.29 ± 3.96 beats/min) condition (Table 2). However, PR in the exercise group had insignificant ($p>0.05$) changes (Table 1). The SBP and DBP in both the group had significantly ($p<0.05$) higher level after the exercise and game (Table 1 & Table 2).

Antioxidant parameters

In case of antioxidant parameters, the FRAP level was insignificantly ($p>0.05$) higher after the game (2.31 ± 0.22 mg TE/100 cm^3) than the before game condition (2.17 ± 0.23 mg TE/100 cm^3) (Table 3). The DPPH value was significantly ($p<0.05$) higher after the game condition (0.86 ± 0.04%) than the before game condition (0.40 ± 0.06%) (Table 3). However, after exercise, both the FRAP and DPPH level were significantly ($p<0.05$) higher after the exercise condition (2.08 ± 0.19 mg TE/100 cm^3 and 0.59 ± 0.03%, respectively) than the before exercise condition (0.59 ± 0.03 mg TE/100 cm^3 and 0.29 ± 0.02%, respectively) (Table 3 & Table 4).

DISCUSSION

Anthropometric parameters

Results found that the temperature was higher after the exercise and game condition. After the game and after exercise, the body temperature was slightly higher than the normal level of body temperature. This might be due to the higher metabolic process in the body due to the exercise and game condition. The higher metabolic processes will increase the higher secretion of the thyroid hormone, which is the primary hormone to regulate the body temperature after increasing or decreasing the BMR of the body.[14] Another consequence may be that an increase in the usage of glucose and the meantime, increasing blood flow as well as induction of the rate of metabolism in multi-organs.[15,16] After the game, the pulse rate was significantly higher than before the condition. This condition might be due to the exercise increased the heart rate.[2] However, the SBP and DBP is minimum pressure exerted in the aorta during the heart relaxation for blood ejection into the aorta from the left ventricle.[2] Both the SBP and DBP were increased after the exercise and game. Both the SBP and DBP were higher than the normal level. This might be due to the changes in the activity of the sympathetic nervous system during the exercise and game condition.[17-19] Overall anthropometric parameters showed that exercise and game caused physiological stress.

Antioxidant parameters

Antioxidant molecules have a role in attenuating, in combating with the oxidative stress in the human body. In our study, total antioxidant power and overall antioxidant scavenging activity were significantly higher after the exercise and game. This might be due to combat the higher level of oxidative stress in the body after the alteration in metabolic status due to the exercise and game.[2,20] Therefore, exercise and games were mostly affected by the salivary properties of boys.

Table 1: Difference of anthropometric parameters of experimental subjects before and after exercise.

Experimental Factors	Temperature (°C)	PR (/Min)	SBP (mmHg)	DBP (mmHg)
Before Exercise	36.03 ± 0.22	80.86 ± 4.43	116.00 ± 4.06	66.57 ± 2.63
After Exercise	37.35 ± 0.22*	93.57 ± 4.36	128.00 ± 1.45*	83.14 ± 1.84*
Normal Level	36.10 – 37.20©	60-100©	<120©	<80©

Means ± Standard Error Mean bearing the superscripts * signifies the difference in a column ($p<0.05$). Student's t-test; PR- Pulse Rate; SBP-Systolic blood pressure; DBP-Diastolic blood pressure; ©(Hall, 2016)

Table 2: Difference of anthropometric parameters of experimental subjects before and after game.

Experimental Factors	Temperature (°C)	PR (/Min)	SBP (mmHg)	DBP (mmHg)
Before Game	36.02 ± 0.21	81.29 ± 3.96	109.57 ± 4.11	68.29 ± 2.83
After Game	37.58 ± 0.16*	96.43 ± 4.82*	124.29 ± 1.43*	81.57 ± 2.14*
Normal Level	36.10 – 37.20©	60-100©	<120©	<80©

Means ± Standard Error Mean bearing the superscripts * signifies the difference in a column ($p<0.05$). Student's t-test; PR- Pulse Rate; SBP-Systolic blood pressure; DBP-Diastolic blood pressure; ©(Hall, 2016)

Table 3: FRAP and DPPH level in saliva before and after game.

Sl. No.	Parameters	Unit	Before Game	After Game
1.	FRAP	mg TE/100 cm^3	2.17 ± 0.23	2.31 0.22
2.	DPPH	%	0.40 ± 0.06	0.86 ± 0.04*

Mean ± Standard Error Mean bearing the superscripts * signifies the difference in a row ($p<0.05$). Student's t-test.

Table 4: FRAP and DPPH level in saliva before and after exercise.

Sl. No.	Parameters	Unit	Before Exercise	After Exercise
1.	FRAP	mg TE/100 cm^3	2.33 ± 0.24	2.08 0.19*
2.	DPPH	%	0.29 ± 0.02	0.59 ± 0.03*

Mean ± Standard Error Mean bearing the superscripts * signifies the difference in a row ($p<0.05$). Student's t-test.

CONCLUSION

The main objective of this study was to determine the changes in the antioxidant properties of boys before and after the exercise and game. Results of anthropometric parameters showed that both the exercise and game caused mild stress in the boys. Due to that mild stress, the salivary antioxidant properties were higher. Therefore, from this study, it might be concluded that salivary antioxidant property may be useful as a biomarker to determine the stress in boys due to exercise and game. In the future, the study should be conducted on the huge number of volunteers for the changes in salivary antioxidant properties in the different time periods of stress due to exercise and game.

SIGNIFICANT STATEMENTS

- For the first time, this study reporting about the salivary antioxidant properties after exercise and game in adult boys.
- The exercise and game have affected anthropometric parameters (pulse rate, systolic blood pressure, and diastolic blood pressure).
- The salivary antioxidant properties of boys were higher after the exercise and game.
- Saliva may be a useful biomarker for oxidative stress during exercise and game.

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Conflict of Interest: NIL.

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