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**Research Article**

# A comparative study on platelet distribution width (PDW) among three different physically active groups

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**Abstract**

The aim of this study was to compare and examine the platelet distribution width (PDW) among highly physically active, moderate physically active and low physically active groups at 16 weeks of observation. Thirteen (13) SAI football students as highly physically active group (SAI), twelve (12) professional physical education students as moderate physically active group (B.P.Ed) and ten (10) general college going students as very low physically active group (GEN) who has normal blood cell count at the beginning of the session with an average age of 21.16±1.85 have participated in this study voluntarily. SAI and B.P.Ed groups were involved in their respective training schedule under the supervision of experts. The researcher observed the all the groups for 16 weeks and collected the data three times for every sample. Platelet distribution width (PDW) has been determined by using Syxmex autohemato analyzer. The result of the study found that in case of SAI trainees, statistically significant increase in platelet distribution width was evident after 2nd month ($q=4.28$, $p<0.01$), but maintained the same level even after the 4th month of training ($q= 0.12$, $p>0.05$). Similar improvement was evident among B.P.Ed trainees in Platelet distribution width after 2nd month ($q=3.29$, $p<0.05$), but maintained in the normal level on the 4th month of training ($q= 0.14$, $p>0.05$). Considerably, no significant change in platelet distribution width was evident in general students after 2nd month ($q=0.10$, $p>0.05$) and even on 4th month of training ($q= 0.15$, $p>0.05$). During 2nd and 4th months of training, SAI and B.P.Ed trainees maintained the platelet distribution width at a better state than the trainees of general students. Moreover, the SAI and B.P.Ed trainees maintained higher Mean platelet volume than the general students.

**Keywords :** IX - XII class school students, Paramecium, environmental stimuli, hay infusion and behaviour

## Introduction

The platelet distribution width (PDW) is a measure of platelet anisocytosis. Pathological and clinical studies have suggested that platelets play an important role in the pathogenesis and progression of cardiovascular diseases (Hirsh *et al.,* 1981; Fitzgerald *et al.,* 1986; Davies *et al.,* 1986). It has also been postulated that regular exercise may reduce the risk of major vascular thrombotic events and protect us against cardio-vascular diseases (Paffenbarger *et al.,* 1975, Morris *et al.,* 1980, Arraiz *et al.,* 1992). However; Siscovick *et al.* (1984) reported that the risk of primary cardiac arrest was transiently increased during exercise. Therefore, physical exercise seems to be able to protect us against cardiovascular disease on the one hand and to provoke sudden cardiac death on the other hand. Accordingly, we hypothesize that different intensities of exercise may affect platelet function differently. Moreover,

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subjects who are physically active and those who are sedentary may respond differently to the same exercise protocol. Various studies, found an increase in platelet counts ranging from 18% to 80% immediately after treadmill or bicycle exercise (Warlow *et al.,* 1974; Meheta *et al.,* 1982; Davis *et al.,* 1990). Despite the increase in platelet number, most studies regarding the effects of exercise on platelet functional behavior, mainly aggregation and secretion, have been either controversial or incomplete (Bourey *et al.,* 1988). In addition, studies of the effect of exercise on platelet adhesiveness are very few because of technical difficulties. This aspect was studied about 20 years ago, and the assays used in previous studies could not distinguish adhesion from the aggregation (Bennett *et al.,* 1972). Therefore, how the various intensities of exercise affect platelet function, is still unclear. PDW measures size variability of platelets.

All studies express that exercises make positive contributions into the human organism. Researchers have reported positive contribution of exercise in physical, physiological, psycho-logical and motor features. It is stated that these differences depend on the severity, duration and frequency of exercise as well as physical and physiological conditions of the subjects (Buyukyazi and Turgay, 2000). Therefore, this study was aimed to find out some fruitful findings about Platelet distribution width (PDW) changes with practicing of three different level of physical activity for 16 weeks.

**Methodology**

**Selection of subjects**

Thirty five (35) male students of age group between 17 to 22 years were selected randomly as the subject for the study. Those 35 students were taken from three groups comprising of thirteen (13) students for highly, twelve (12) students to moderate physically active groups and ten (10) students for very low active sedentary group. Active groups and ten (10) students for very low active sedentary group.

**Group I (HAG):** Thirteen (13) fresh male students of the SAI training center (soccer), Burdwan will be selected as highly physically trained group. Subjects who are undergoing a coaching program in football under SAI have to follow a vigorous conditioning schedule to improve their general as well as specific fitness followed by a coaching schedule for the development of football skills.

**Group II (MAG):** Twelve (12) fresh male Physical Education students of Department of Physical Education, Jadavpur University will be selected as a moderate physically trained group. Student pursuing the one year program of Physical Education leading to the degree of Bachelor of Physical Education is required to maintain a moderate level of physical fitness in order to follow different practical classes round the year.

**Group III (LAG):** Ten (10) first years (Arts) male students from the Burdwan Raj College and Vivekananda College under Burdwan University will be selected as very low active sedentary group. They generally participate in sports program not on a regular basis and their objective of participation in such program is to have fun, enjoyment and recreation and as such it is voluntary (Table -1).

**Collection of Blood Sample**

The blood samples were taken in the morning between 6.30 am to 7.30am. Blood samples from subjects were taken after 12 hour hungry and having refrained from vigorous exercise for at least 24 hours. The subjects were lay down or sat on the arm chair. Examination of the superficial veins of the left forearm was made to select the vein for venous puncture. About 3ml of blood was collected from each subject and captured in the anticoagulant (EDTA) tube.

**Analyzing blood sample**

All blood sample was analyed by Sysmex XP-100 Automatic hematology analyzer (Sysmex

**Table -1. Experimental design**

| Groups | Pre-test | Intermediate | Post-test |
|---|---|---|---|
| Highly physically trained (SAI) (N=13) | At the beginning of the session | After 8 week or 2 month of training | After 16 week or 4 month of training |
| Moderately physically trained (B.P.Ed) (N=12) | At the beginning of the session | After 8 week or 2 month of training | After 16 week or 4 month of training |
| Low physically active (GEN) (N=10) | At the beginning of the session | After 8 week or 2 month of training | After 16 week or 4 month of training |

**Table – 2. Status of Platelet distribution width (femto litre) among three different physically active groups**

| Groups | 1st Test M (SD) | 2nd Test M (SD) | 3rd Test M (SD) |
|---|---|---|---|
| Highly physically trained (SAI) | 20.27 (3.71) | 27.97 (2.87) | 25.02 (2.88) |
| Moderately physically trained (B.P.Ed) | 20.66 (3.88) | 22.36 (5.50) | 23.26 (4.59) |
| Low physically active (GEN) | 16.84 (0.77) | 16.77 (0.74) | 16.77 (0.72) |

Normal value: 15 to 17 fl (femtolitre)

**Table - 3. Result of Repeated Measures ANOVA for (PDW) level (SAI, BPEd and General students)**

| Source of Variation | SS | df | MS | F |
|---|---|---|---|---|
| TOTAL | 1490.35 | 44 | -- | -- |
| Between Subjects (A) | 203.56 | 14 | -- | -- |
| Within Subjects (B) | 436.20 | 30 | -- | -- |
| Treatments | 443.47 | 2 | 221.73 | 15.25** |
| Residual | 407.12 | 28 | 14.54 | |

Normal value: 15 to 17 fl (femtolitre)

Corporation , Kobe, Japan). [*Code No. BB556095*, *Manufactured : July 2012*, *Software version: 00-05 and onwards*].

**Results**

Overall result revealed that in SAI trainees, the Platelet distribution width during 1st, 2nd and 3rd test were perhaps different, because statistically differences in Platelet distribution width during 1st, 2nd and 3rd test were evident for SAI, B.P.Ed. and General students ($F=15.25$, $p<0.01$) (Table -3).

Depending upon the F-value, since there is a need for a post hoc analysis, the researcher employed *Newman- Kuels post hoc test* to locate exact values of differences in Platelet distribution width between three physically active groups.

For SAI trainees, the Platelet distribution width (femtolitre) during 1st, 2nd and 3rd test were 18.25, 30.52 and 29.48 respectively. Here, the changes in Platelet distribution width were found progressively increased, but exceed above the normal range.

For B.P.Ed trainees, the Platelet distribution width (femtolitre) during 1st, 2nd and 3rd were 19.08, 24.47 and 24.55 respectively. Here, the changes in Platelet distribution width were found progressively increased, which remained in the upper side of the normal range.

**Table - 4. Adjusted Ordered Means in Platelet distribution width during 1st test, 2nd test and 3rd test phases**

| Groups | 1st test (femtolitre) | 2nd test (femtolitre) | 3rd test (femtolitre) |
|---|---|---|---|
| SAI | 18.25 | 30.52 | 29.48 |
| B.P.Ed. | 19.08 | 24.47 | 24.55 |
| General Students | 16.99 | 16.95 | 17.00 |

1st test = base level test, 2nd test = after 2nd month of respective training, 3rd test = after 4th month of respective training.

**Table - 5. Newman-Kuels post hoc test difference in Platelet distribution width during 1st, 2nd and 3rd test Phases**

| SAI Group | 2nd test | 1st test |
|---|---|---|
| 3rd test | 0.12 | 3.96* |
| 2nd test | -- | 4.28** |
| **B.P.Ed. Group** | | |
| 3rd test | 0.14 | 3.33* |
| 2nd test | -- | 3.29* |
| **General Students** | | |
| 3rd test | 0.13 | 0.09 |
| 2nd test | -- | 0.10 |

* p<0.05, ** p<0.01, *1st test = base level test, 2nd test = after 2nd month of respective training, 3rd test = after 4th month of respective training.*

For General students, the Platelet distribution width (femto litre) during 1st, 2nd and 3rd test were 16.99, 16.95 and 17.00 respectively, but remained at the upper side of the normal range (Table -4).

For SAI group statistically significant increase in Platelet distribution width was evident after 2nd month (q=4.28, p<0.01), but maintained the same level, even after the 4th month of training (q=0.12, p>0.05). For B.P.Ed group statistically significant increase was evident in Platelet distribution width after 2nd month (q=3.29, p<0.05), but maintained in the normal level on 4th month of training (q= 0.14, p>0.05). For general students No significant change in Platelet distribution width was evident after 2nd month (q=0.10, p>0.05) and even on the 4th month of training (q= 0.15, p>0.05) (Table -5).

Platelet distribution width of SAI and B.P.Ed. students were although remained at outside the upper range, similar status of the Platelet distribution width of the BPEd students was evident, whereas Platelet distribution width of the SAI remained was higher than the B.P.Ed. students.

**Table - 6. Newman-Kuels post hoc test indicating difference in Platelet distribution width between three physically active groups**

| Group | B | A |
|---|---|---|
| C | 2.09* | 2.45* |
| B | -- | 2.69* |

* p<0.05, ** p<0.01, A = SAI group, B = B.P.Ed. group, C = General students group

Statistically significant difference in Platelet distribution width was evident between SAI Vs B.P.Ed groups (q=2.69, p<0.05). However, the status the of the Platelet distribution width of SAI groups was higher than the General students (q= 2.45, p<0.05) and B.P.Ed vs General higher students (q=2.09, p<0.05). Thus, SAI and B.P.Ed

trainees maintained platelet distribution width at a better state than the trainees of general students (Table -6).

In case of SAI trainees, statistically significant increase in platelet distribution width was evident after 2nd month (q=4.28, p<0.01), but maintained the same level, even after the 4th month of training (q= 0.12, p>0.05). Similar improvement was evident among B.P.Ed trainees in platelet distribution width after 2nd month (q=3.29, p<0.05), but maintained in the normal level on the 4th month of training (q= 0.14, p>0.05). Considerably, no significant change in platelet distribution width was evident in General students after 2nd month (q=0.10, p>0.05) and even on 4th month of training (q= 0.15, p>0.05). Thus, the result revealed that during the 2nd and 4th months of training, the SAI students could show significant increase in platelet distribution width, although remained on the outer side of normal limit. However, the BPEd student group could maintain the similar level of platelet distribution width like SAI students during 2nd and 4th months respectively. Such result infers a progressive trend in the increase of platelet distribution width exists in the SAI trainees and B.P.Ed students. Amazingly, general students' platelet distribution width was unchanged and remained in the normal limit during 2nd and 4th months respectively.

Platelet distribution width of SAI and B.P.Ed students were although remained at outside the upper range, similar status of the platelet distribution width of the B.P.Ed students was evident, whereas platelet distribution width of the SAI remained was higher than the B.P.Ed students. Thus, SAI and B.P.Ed trainees maintained the platelet distribution width at a better state than the general students.

**Discussion**

The present study also revealed that the PDW values were significantly increased after training in highly and moderately physically trained

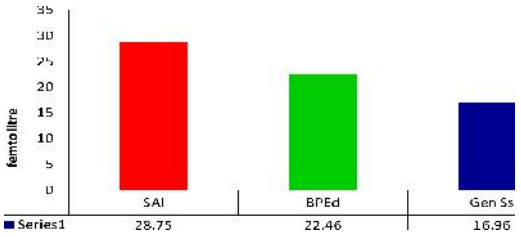


**Fig.-1. Platelet distribution width of the trainees of SAI and BPEd compared to general students**

group (SAI and B.P.Ed) than the low physically active group (GEN) were moderately physical active group shown better incensement than others. As any increase in thrombocyte parameters can be explained in hemoconcentration due to exercise, this can be also explained that factors which put the body under pressure and create stress, cause activation in the nervous system and increase blood-platelet counts (Fox *et al.,* 1999; Gunay, 2006). It was stated that these differences depend on the intensity and time of an exercise program. Some researches indicate that there are no changes in thrombocyte levels due to low intensity or short-term exercises (Chen *et al.,* 1988), other researches inform that thrombocyte level increases due to high intensity or long-term exercises (De *et al.,* 1987). It is suggested in the literature that there are short-term, temporary increases in peripheric thrombocyte counts due to maximal and submaximal intensity exercises, its count does not change due to lower and short-term, moderate exercises (Chen *et al.,* 1988; Manucci *et al.,* 1998; Cinar *et al.,* 2010).

**Conclusion**

During 2nd and 4th months of training, SAI and B.P.Ed trainees maintained the platelet distribution width at a better state than the trainees of general students. Moreover, the SAI and B.P.Ed trainees maintained higher Mean platelet volume than the general students.

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