

Impact of Physical Education Curriculum on Academic Achievement of Higher Secondary School Students in India

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Abstract: In the present study, the researchers were mainly interested in investigating the impact of PE curriculum on the academic achievements of the Higher Secondary (HS) level (10+2) students belonging to two different educational boards in India i.e., West Bengal Council of Higher Secondary Education (WBCHSE) and Central Board of Secondary Education (CBSE). On the basis of simple randomization, one hundred eighty (N=180) HS level boys were selected from four schools (two schools from each board) as participants for the present study. Among 180 students, 120 students [60 from each educational board, WBCHSE acted as experimental Group-I (EG_{WB-I}); CBSE acted as experimental Group-II (EG_{CB-II})] were so selected that they had PE as a compulsory subject and rest, 60 students [30 from each educational board, simultaneously acted as Control Group (CG_{WB+CB})] had either computer science or painting as a compulsory subject in place of PE. The students of EG_{WB-I} & EG_{CB-II} underwent two different PE curriculums as training interventions over an academic year (11 months). But the CG_{WB+CB} did not receive any PE curriculum as a training intervention. The student's academic achievement was measured by obtained marks in two common subjects (Bengali and English) for both boards. It was standardized through T-score and finally, composite T-score were calculated for all the subjects to draw statistical inference on academic achievement. Statistical inference on academic achievement among the groups in baseline and post-test were drawn through ANCOVA followed by Tukey's LSD post-hoc test. Significance was tested at $p < .05$ level. Both EG_{WB-I} & EG_{CB-II} showed a significant difference compared to the CG_{WB+CB} in academic achievement. But no significant difference was observed between EG_{WB-I} & EG_{CB-II}. The academic achievement of the students having PE as a subject improved significantly compared to the students having no PE as a compulsory subject in both boards. But the PE curriculum in both boards was found to be equally effective for developing students' academic achievement.

Keywords: Educational Curriculum, Board of Education, WBCHSE, CBSE, PE Curriculum, Cognitive development



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1. Introduction

Physical Education, a most neglected part of the educational curriculum in India and other third world countries in Asia, should be given more stress in the educational curriculum to fulfill the all-round development of the students in all three educational domains i.e., the cognitive, the psychomotor and the affective [1] to make the curriculum more enjoyable, stress free and successful for the royal achievement in the entire way of an academic journey. So Physical Education has a significant role in the educational curriculum. For preparing the youth, Physical Education gives them room to grow up physically, mentally, socially and emotionally. In Indian educational curricula, recently Physical Education has been given little importance after a long-lasting deprivation and regret in the educational curriculum all over the country. Just a few years back, it was implemented as a compulsory subject in primary, upper primary and higher secondary levels in West Bengal, where mysteriously, in the secondary level, it has still become neglected. On the other hand, in the rest parts of the country, through the Central Board of Secondary Education it has still not been implemented in primary, upper primary and secondary levels as a compulsory subject, however, in higher secondary level physical education existed as an elective subject in the CBSE schools. This shows the poor status of the subject and disregard in the mindset of the educationist and the Government, both state and central, who have neglected the subject without which no curriculum has been completed in the advanced countries.

The curriculum illustrates designed values or goals activated through a cumulative development process and from successful learning experiences for students [2]. The educational curriculum is important and one of the different dimensions of curriculum helps satisfy our educational standard as per requirement [3]. At the very outset, Physical Education started its

journey with tumbling steps and crossed the hurdles in the long way to establish itself as an integral part of the school curriculum. In India, there are several boards of education in secondary and higher secondary level in different states, however, a central board of education exists all over the countries bilaterally where separate school curriculum runs. In West Bengal, a state situated in the eastern part of India, the school board responsible for higher secondary education is known as the West Bengal Council of Higher Secondary Education (WBCHSE). In contrast, the central board at the same level is known as Central Board of Secondary Education (CBSE). In both the boards of education (WBCHSE & CBSE), different physical education curriculums continue at the higher secondary level that was developed by the Education Department of the respective Government, i.e., Govt. of West Bengal and Govt. of India [4].

The educational goal that is achieved to an extent by the institution i.e., the teachers and the students in their academic performance, is called academic achievement. An examination is a very common process of assessment of academic achievement. Still, there is a disagreement among educationists that an examination cannot always be considered the best process for assessing the skills and the declarative knowledge of the fact in a specific domain [5]. In an ideal curriculum, a certain proportion (14–26%) or more of the entire curriculum content should be constituted on physical education contents to make the whole learning process faster and easier to reach specific goal, particularly in the psychomotor domain in an accelerated manner for the accomplishment of the academic skills [6].

Academic achievement is not influenced by the overall health related PE curriculum [7]. To get the utmost benefits of physical education, the application of public policy as a daily requirement for Physical Education can be introduced from the primary section without breaking up academic development. The school education boards should cheer up a compulsory daily Physical Education activity policy in schools to promote positive health habits from childhood [6]. The nature and intensity of Physical Education classes positively affect on cognition and academic success of the students [8]. Physical Education should be included in the school curriculum by managing the time from other subjects without hampering or compromising student's academic performance. In contrast, adding more time from Physical Education classes to other

classes does not increase the score in the subject but may be detrimental to healthy life [9].

In the context of a child's health and cognitive development, physical activity is the key factor that cannot be separated from their academic achievement. Physical activity is not only important to boost academic progress, but it also helps to filter destructive behavior and reduces school drop-out [9]. Regular physical activity benefits the body and mind and reduces stress levels, which has a beneficial effect on the mind in terms of academic performance [10]. Consequently, the research on Physical Education contents as a part of the total curriculum had not reached an optimum level irrespective of the board of education like WBCHSE, CBSE & ICSE (Indian Certificate of Secondary Education) in India. From this perspective, the researchers were urged to frame a study related to the Physical Education curriculum. The concept of physical training or physical activity classes was utilized by teachers from a few years back for physical development only. Still, the multidisciplinary dimension of Physical Education leads to some development of an individual. So that it improves all the aspects i.e. physical, mental, social, emotional, intellectual and spiritual aspects of an individual. Therefore, for the present study the researchers were interested to find out the impact of the Physical Education curriculum in school settings of two boards (WBCHSE & CBSE) on academic achievement. It is already proved that physical education or physical activity significantly impacts on academic achievement [10]. This point of view led the researchers to investigate the effect of the Physical Education curriculum for as long as an academic year (11 months) on school students' academic achievement. So, it was hypothesized that the students in this study would be shown an improvement in academic achievement. The result of the present study would be helpful to the different school boards, educationists, physical educationists, curriculum researchers and policy makers.

2. Material & methods

2.1 Participants

Initially, 195 higher secondary boy's school students were involved as subjects in this study. The participants were randomly chosen from the four schools of Nadia and North 24 Parganas districts of West Bengal – an eastern state of India. All the selected participants for this study were aged between

17 and 19. All the participants were finalized and confirmed after thorough medical check-ups. Prior to the commencement of this study, a signed copy of consent & willingness was taken from each participant along with their parents. Before starting this research work, written consent from the institution's head was also collected. The Departmental Research Committee (DRC) of the University of Kalyani approved the research proposal and issued the necessary permission for conducting the study. After confirming the groundwork and essential planning required for starting the research work, data (baseline) were collected on the academic achievement score (AAS) from their 10th standard mark sheet. The respective schools administered the physical education curriculum according to their timetable. The researchers monitored the attendance of the participants in physical education classes after certain intervals. During the Physical Education curriculum, 15 irregular participants in the school were excluded. Finally, one hundred eighty (N=180) students who were very regular in the physical education classes were finalized as participants for this study. After completing of the physical education curriculum, final board examinations of the respective boards were held. The researchers waited for the publication of the results of the board exam. After the publication of the results, post-treatment data were collected from the mark sheets of the participants. Demographic details of the information (in the baseline) of the students have been presented in Table 1.

2.2 Procedures

Academic achievement score (AAS): For collecting data on academic achievement score (AAS) in the present study, marks obtained in English and Bengali were taken from their mark sheets in the 10th and 11th standard final board examinations as an indicator of academic achievement. These two subjects were chosen as they were common subjects to all the students (science and arts) in the curriculum of both educational boards. Here the marks obtained in English and Bengali in the 10th final board examination for all the students of different groups (EG_{WB-I}, EG_{CB-II} and CG_{WB+CB}) were considered as pre-test (baseline) data for academic achievement. Again, the marks obtained in English and Bengali in the 11th final board examination for all the students of different groups (EG_{WB-I}, EG_{CB-II} and CG_{WB+CB}) were considered as post-test data for academic achievement in the present study.

Table 1. Demographic details of the subjects of different groups.

Name of the groups	No. of subjects (N = 180)	Age	Height	Weight	BMI
		(years) Mean ± SD	(cm.) Mean ± SD	(Kg.) Mean ± SD	(Kg.m ⁻²) Mean ± SD
Experimental Group-I (EG _{WB-I})	60	17.52 ± 0.70	167.35 ± 5.99	56.52 ± 10.43	20.17 ± 3.70
Experimental Group-II (EG _{CB-II})	60	17.03 ± 0.26	169.73 ± 5.81	60.00 ± 07.51	20.84 ± 2.37
Control Group (CG _{WB+CB})	60	17.38 ± 0.64	165.13 ± 7.42	59.95 ± 14.22	22.03 ± 3.12

Experimental Group-I (EG_{WB-I}) Consisted of the students with physical education subject from WBCHSE; Experimental Group-II (EG_{CB-II}) Consisted of the students with physical education subject from CBSE; Control Group (CG_{WB+CB}) = Consisted of the students without physical education subject from WBCHSE & CBSE simultaneously; BMI = Body mass index;

Obtained marks in English and Bengali were standardized by using T-scale with the help of the following standard equation: $t\text{-score} = 10z + 50$ (*In this scale, the value of standard deviation and mean are always constant with a value of 10 and 50, respectively, Z denotes z-score*).

The value of the z-score was calculated by using the equation $z = \frac{X-M}{\sigma}$, (*where X= raw score, M = mean of the distribution & σ = SD of the distribution*), After standardizing the obtained marks of both subjects (English and Bengali) separately into the standard score, a composite standard score (CSS) was calculated for each participant separately by simply adding the standard scores of both subjects. This composite standard score (CSS) was considered as data of academic achievement score (AAS) for the individual participants.

2.2.1 Experimental design & Experimentation protocol:

In this study, a pre-test post-test experimental design was used with two experimental groups and a single control group (shown in Fig. 1) recruited for the experimentation. Physical education programs in the academic curriculum for both boards (WBCHSE & CBSE) were considered as experimental protocols. It was continued for an academic year (11 months). Here both the experimental groups (EG_{WB-I}, EG_{CB-II}) underwent their academic curriculum where physical

education programs (classes, both theory & practical) intervened according to the respective school timetables. But the control group (CG_{WB+CB}) did not receive any Physical Education program as the students of this group have no physical education subject. The Physical Education curriculums (WBCHSE & CBSE) were developed by the Education Department of the respective Government, i.e., Govt. of West Bengal and Govt. of India [4] have been briefly described below.

WBCHSE Physical Education Curriculum: Like every subject, Physical Education also has a scientifically structured (approved by West Bengal Govt., Education Department) syllabus for WBCHSE, which carries 100 marks in total. Out of a hundred, 40 marks are allotted to the theory part and 60 marks are allotted to the practical part. The theory portion of the syllabus contains four chapters i.e., Chapter-1: Concept and History of Physical Education, Chapter-2: Health Education, Chapter-3: Scientific Basis of PE and Chapter-4: Physical Education Management Programme. Again, each chapter consisted of five subtopics. In the practical part, total 60 marks were equally divided into seven groups i.e., Group-A: Formal activities (Marching, Brotachari & Calisthenic), Group-B: Athletics, Group-C: Yoga Asana & Gymnastics, Group-D: Team Game, Group-E: Evaluation of Physical fitness, Group-F: National ideals & Leadership Development Activities and Group-G: Sports the Participation [4].

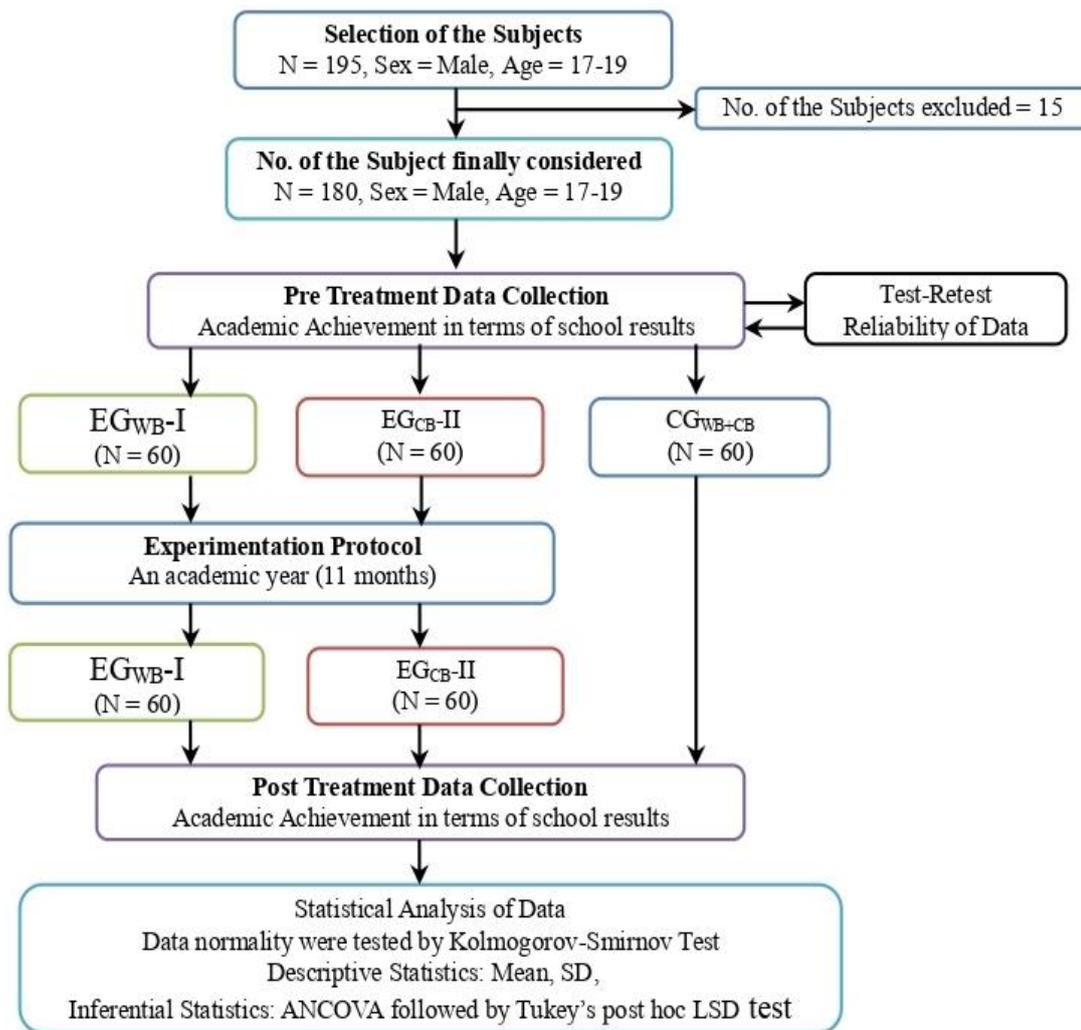


Figure 1 Experimental Design.

Table 2 Details of the Physical Education Protocol according to the Curriculum of WBCHSE & CBSE.

PHYSICAL EDUCATION CURRICULUM					
Board	WBCHSE		CBSE		Duration of the experimentation 11 months
Type of class	Theory	Practical	Theory	Practical	
Marks	40	60	70	30	
Weekly classes	3	2	3	2	
Time	40m/class	40m/class	40m/class	40m/class	

CBSE Physical Education Syllabus: Like every subject, Physical Education also has a scientifically structured (approved by govt. of India, Education department) syllabus for CBSE, which carries 100 marks in total. Out of a hundred, 70 marks are allotted to the theory part and 30 marks are allotted to the practical part. The theory portion of the syllabus contains of ten chapters i.e., Chapter-1: Changing Trends & career in Physical Education, Chapter-2: Olympic Value Education, Chapter-3: Physical Fitness, Lifestyle and Wellness, Chapter-4: Physical Education and Sports for Children with Special Needs- Physical education for the challenged population), Chapter-5: Yoga, Chapter-6: Physical Activity and Leadership, Chapter-7: Test, Measurement & Evaluation, Chapter-8: Fundamentals of Anatomy, Kinesiology and Physiology in Sports, Chapter-9: Psychology & Sports and Chapter-10: Training & Doping in the Sports. In practical five sections are there i.e., Physical Fitness Test, Proficiency in the Games & Sports, Yogic Practices, Record File and Viva Voce.

Throughout the session 2019-2020, the above said curriculums were implemented for class-XI as per the following timetable (Table 2). In both the boards (WBCHSE & CBSE) weekly, three theory classes and two practical classes were allotted in the timetable of the schools where the duration of each class was 40 minutes.

2.3 Statistical analysis

Data has been presented as Mean and SD. Correlation coefficient (r) was calculated on the baseline data to test reliability. Data normality was tested through Kolmogorov-Smirnov test, which confirmed that the data were normally distributed. Therefore, a parametric statistical tool called analysis of covariance (ANCOVA) was used to draw the statistical inference on academic achievement scores. Conformity of the difference between the means was judged by a post hoc test called Tukey's LSD test. In all aspects, the significance was tested at $p < .05$ level. Percentages of change in academic achievement were calculated by the equation as follows:

$$\Delta\% = \frac{(\text{Adjusted Post test mean} - \text{Baseline mean})}{\text{Baseline mean}} \times 100$$

A popular software package known as social science statistics was used to calculate data normality through Kolmogorov-Smirnov test. Vassar Stats software package was used to calculate F-value through ANCOVA. In Microsoft windows, office version

10, excel spreadsheets were used to calculate Tukey's LSD test and other statistical calculations.

3. Results

A significant improvement ($F=3.102$; p -value = .04) in academic achievement was observed in both the experimental groups, i.e., EG_{WB-I} and EG_{CB-II} concerning CG_{WB+CB} . Again, it was found that due to the implementation of physical education curriculums (CBSE & WBCHSE), the percentage of change in academic achievement for EG_{WB-I} , EG_{CB-II} and CG_{WB+CB} were 3.64%; 3.98% and 0.02% respectively. Thus, the EG_{CB-II} improved best in academic achievement due to the participation in the physical education program for an academic year (11 months). In Table 3, the details of ANCOVA have been shown and the mean value of academic achievement in different testing conditions has been presented in Fig 2.

The post hoc test, popularly known as Tukey's LSD test was used to identify the significant difference existed between the mean values in academic achievement of the groups. Both experimental groups (EG_{WB-I} & EG_{CB-II}) significantly differed in the academic achievement compared to the control group (CG_{WB+CB}). But no significant inter group mean difference was found between the experimental groups (EG_{WB-I} vs EG_{CB-II}) in academic achievement. In Table 4, the results of the Tukey Test have been shown.

4. Discussion

The findings of the present study indicated a significant improvement in academic achievement ($F=3.102$; p - .04) as measured through academic achievement scores from the marks obtained in the common subjects of both school board mark sheets for all the groups i.e., West Bengal Council of Higher Secondary Education –Physical Education Group (EG_{WB-I}) and Central Broad Secondary Education – Physical Education Group (EG_{CB-II}) was found in comparison with the control group (CG_{WB+CB}). The result of the present study accorded with the findings of [1, 6–8, 11–13] for the development of academic achievement (improvement percentages were 3.64% and 3.98%, respectively). Thus, physical education program had a positive impact on academic achievement. This finding can be discussed as follows - Physical education (PE) is not only helping to develop

one’s physical aspect but also helps to develop a mental and intellectual aspects of well-being [14–17].

Table 3 Analysis of Covariance (ANCOVA) of academic achievement among EG_{WB-I}, EG_{CB-II} and CG_{WB+CB}.

Test	EG _{WB-I} (T score)	EG _{CB-II} (T score)	CG _{WB+CB} (T score)	Source of variance	SS	df	MS	'F' Ratio	p-value	
Baseline	Mean	98.01	98.12	98.08	Between	0.34	2	0.17	0.001	.99
	± SD	17.82	17.57	17.49	Within	55175	177	311.72		
Post Test	Mean	101.53	102.07	98.11	Between	553.29	2	276.65	0.763	.46
	± SD	19.68	19.97	17.37	Within	64175.87	177	362.58		
Adjusted post test	Mean	101.58	102.03	98.10	Between	554.13	2	277.06	3.102	.04
	(Δ %)	3.64%	3.98%	0.02%	Within	15718.42	176	98.31		

EG_{WB-I}=WBCHSE Physical Education students group; EG_{CB-II}=CBSE Physical Education students group; CG_{WB+CB}=Control group; SD=Standard Deviation; SS=Sum of Square; df=degree of freedom; MS=Mean squares; Δ%=Percentage of Improvement in academic achievement.

Table 4 Tukey’s LSD post-hoc test on academic achievement in adjusted post test mean score for different groups.

Adjusted Post Test Mean Scores			Mean Difference (MD)	Critical difference (CD)
EG _{WB-I}	EG _{CB-II}	CG _{WB+CB}		
101.58	102.03		0.447	3.399
101.58		98.10	3.478*	3.399
	102.03	98.10	3.925*	3.399

EG_{WB-I}=WBCHSE Physical Education students group; EG_{CB-II}=CBSE Physical Education students group; CG_{WB+CB}=Control group;

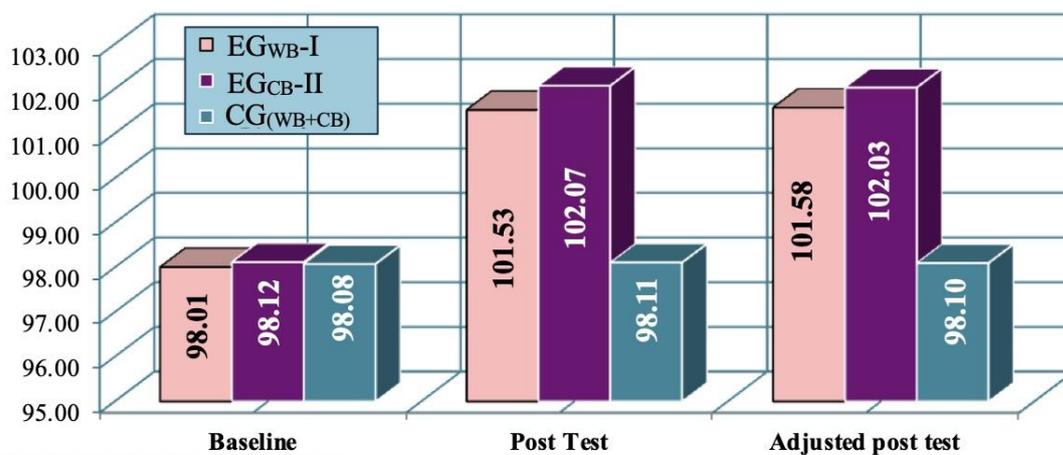


Figure 2 Mean Values of Academic Achievement Baseline, Post Test & Adjusted Post Test for Experimental Groups (EG_{WB-I} & EG_{CB-II}) and Control Group CG_(WB+CB).

Physical activity helps to stimulate the nerve system, which leads to the secretion of so many enzymes and hormones. This elevated level of enzymes and hormones helps to develop one's cognitive ability. Cognition is a process of knowing the unknown facts and make a perception or judgment about the fact. In this way, physical activity (PA) helps to develop one's academic performance [11, 18–22]. Physical education is a subject where a student gets theory as well as practical knowledge regarding physical activities, which leads the students to get the maximum benefits of physical education classes [16, 22–25]. Therefore, the researchers believe that participating in physical activity (in different games and sports) during the PE practical classes might cause a significant improvement in academic achievement.

Still, today the society is not ready to accept sports as equal to education [19, 20, 26]. Parents are very much worried about competency based education but are not bothered about health education [14, 16, 27]. As a result, students suffer from stress and tension. A well planned physical activity has a significant effect on children's physical health, mental function, and psychological well-being [13, 28]. Physical education is a good way to drain out stress and tension and also provides a healthy space to grow up [11, 21, 29]. Physical education helps to make a complete human being and develops academic performance [7, 12, 25]. It was also proved that academic achievement was not significantly related to enrollment in PE [26]. Increased PE could help academic achievement and cognitive performance. The intensity of PE classes might play a significant role in the positive impact of physical activity on academic success & cognition [8, 30]. It was suggested that Physical activity was positively correlated with the student's academic performance [31, 32]. Thus college & school administrators should recognize the positive effect of physical activity on students & make them ready to engage in various extracurricular activities [10].

PE should be promoted for its versatile benefits and the panic of negative effects on academic achievement didn't look as a lawful reason for reducing or eliminating the PE programs. Schools should try to follow the national health objective of daily physical education and arrange a balanced academic program for students, which includes all the scopes for physical activity [14, 19, 27]. PE, as well as physical activity, is essential for all grades of students. One study suggested the importance of daily physical activities for

kindergarten students to get the opportunity to enhance their physical health. This study didn't report any negative influence on academic achievement [24]. The short terms of physical activities are important for calculation, reading fluency and memorization. Thus to incorporating physical activity during academic learning, teachers should need to encourage the students to devote time to physical activity [33, 34].

Therefore, it was transparent that PE or physical activity has no adverse effect on academic achievement thus it can be included in the regular educational curriculum. Physical activity could be included in the school educational curriculum by adjusting time from other subjects with no risk of hampering the students' academic success [35, 36]. It was also observed that adding extra time to academic subjects by adjusting time from PE program doesn't improve the grades in particular subjects and may be harmful to health [9]. Though PE is detrimental to health, the school authorities, when they felt the requirements of preparing the children for exams, have excluded time from children's physical activity programs [13]. Physical activity during school break time also may facilitate academic performance [25]. From the result of the present study, it was also clear that irrespective of mediums or boards, physical education is helping to improve academic performance as a whole.

5. Conclusion

After the end of the experiment, it was found that both experimental groups (EG_{CB-II} & EG_{WB-I}) showed an improvement of 3.98% & 3.68%, respectively in academic achievement in comparison to the control group (CG_{WB+CB}) with an improvement recorded as 0.02%. It was also found that EG_{CB-II} improved significantly better than EG_{WB-I} in academic achievement. Based on the findings of the present study following generalized conclusion can be drawn –

- 1) The academic achievement of the students of both the experimental groups (EG_{CB-II} & EG_{WB-I}) i.e., HS students with physical education as an elective subject, improved significantly better in academic achievement in comparison with the HS students without having physical education as an elective subject for both the boards (CBSE & WBCHSE). Thus, it is proved that physical education has a positive impact on the academic achievement of the students.

2) But no significant difference was found between the improvement of academic achievement of the students belonging to the two different boards (CBSE & WBCHSE) having physical education as an elective subject. It confirms that both the Physical Education curriculums (CBSE & WBCHSE) are equally effective for the improvement of academic achievement of the HS students.

The findings of the present study support the hypothesis, therefore, it is accepted. The improvement percentage of academic achievement of EG_{CB-II} was slightly higher (3.98% ~ 3.64% = 0.34) than EG_{WB-I}, but no significant difference was found. Thus, the physical education curriculum can be applied to develop academic achievement.

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Authors Contribution

All the authors equally contributed to the work and approved of the final version of this manuscript.

Does this article screened for similarity?

Yes.

Conflict of interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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