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Comparative effects of senior secondary physical education curricula on holistic adolescent development: A multi-board longitudinal study in hyderabad, telangana

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Abstract:
The role of physical education in schools is a debate that goes on; however, the necessity of these classes is not a question for all students. In the city of Hyderabad, we conducted a two-year longitudinal study in order to analyze the effects of physical education classes during senior secondary school in three different boards, namely, CBSE, State Board, and ICSE on the overall holistic development of the students. We evaluated their physical fitness, daily activity, mental health, social skills, and academic performance. Among the most significant findings was the curriculum design which incorporated the provision of playtime, teacher's quality, etc. that had a tremendous impact on students' outcomes. To illustrate, the boards with a more hands-on approach to practical activities were noted to have larger gains in fitness and emotional well-being.Our study has indicated that the Ministry of Education's advise about the need for educational programs to be consistent across the different board of education is right. The implementation of this recommendation would mean that every student irrespective of the board in which their school belongs wouldn't miss out on the opportunity of growing and developing physically, mentally, and socially through the physical education classes.

Keywords:Physical Fitness, Development in Adolescence, Indian Examinations Boards, Longitudinal Study, and Holistic Education

I. INTRODUCTION

Adolescents are the stage of the human life that is mainly determined by the nature; they are the ones who experience the most rapid change in their physical, mental and even emotional aspects. In this context, the role of Physical Education in schools goes beyond merely being a fun and games subject; it is an integrated intervention that is skillfully planned and carried out so as to ensure the balanced, complete development of the child. The years of senior secondary schooling provide the best opportunity for the acquisition of right health habits and skills that will last a lifetime. Unfortunately, this is not the case in the Indian education system which is highly varied and where different school boards follow their own different curricula; hence the potential of Physical Education is not consistently tapped.The variation in the educational policies that govern different school boards has a major impact on student outcomes since there exist profound differences in the duration of instruction, practical emphasis, teacher qualification and provision of facilities for both class and sports activities among these boards.This research is concerned with the Hyderabad District, Telangana, which is a true microcosm of the Indian educational system having its schools affiliated to multiple boards, and it aims at pinpointing this extremely significant issue. The study will take a long-term view in assessing how the senior secondary Physical Education curriculum of the three major boards - the CBSE, the Telangana State Board and the ICSE - influences the overall development of the adolescents. The purpose of the study is to provide scientific evidence of the impact of curriculum design on student development, thus offering critical insights into aligning policy with practice and ensuring that all the students, regardless of their board of education, receive quality physical education.

II. LITERATURE SURVEY

The literature that has been reviewed till now confirms the various roles that Physical Education plays in the development of adolescents, thus connecting quality programs to better fitness, cognitive functions, and psychosocial outcomes. But, most of the research comes from Western countries and there is a big shortage of longitudinal as well as comparative studies in India where the multi-board educational system is prevailing. Although the national frameworks like the National Education Policy 2020 and National Curriculum Framework promote holistic education and suggest more physical activities, studies done by experts like Lobo and Singh have still pointed out the existence of the theory-practice gap and the differences in infrastructure across schools that hinder the implementation of the policies.As a rule, past research looks at a single board on its own with only a little empirical comparison of the different impact that the curricular structures of boards such as CBSE, ICSE and State Boards have on students' varied courses of development. Identity studies reveal the differences in syllabus content and contact hours but they do not track the development impact over time. Moreover, even if socioeconomic status and gender are considered to be the main factors that influence the situation, the specific interaction between board-level PE policies and the moderators is still not investigated. The present research clearly fills these voids by using the longitudinal, multi-domain design method to compare the impacts of different senior secondary PE curricula. It lays the groundwork and offers the comparative evidence that is necessary for curriculum harmonization and equitable policy reform based on informed decisions.

III. PROPOSED WORK

The proposed research will be conducted over two years with a longitudinal approach involving Hyderabad senior secondary students as participants. The main objective of the study is not only to inquire about the theory conceptually but also to investigate how the physical education classes in three different educational boards are CBSE, the Telangana State Board and the ICSE have different impacts on the growth of adolescents. A certain group of students will be monitored, and their progress will be measured regularly all in all five interconnected domains. These domains are physical fitness and daily activity patterns, mental and emotional wellbeing, socioemotional competencies like teamwork and resilience, and academic engagement. In addition, a systematic curriculum analysis of Physical Education frameworks for each board will be done simultaneously. This will include mapping out the prescribed syllabus, the critical balance of practical and theoretical sessions, the methods of student assessment, and availability of sports infrastructure and qualified teachers in the schools. Students developmental trajectories linked to these concrete curricular elements will lead to identifying specific factors that most significantly drive positive outcomes. We will examine how these factors together with individual student backgrounds create different paths of growth.This work's final aim is to produce strong, real-world evidence that can facilitate substantial policy and pedagogical improvements. The present findings will become an important practical guide for education and policymaking by clearly demonstrating the impacts of various curricular designs. We aspire to be a part of the national endeavor to render Physical Education programs more just, effective, and comprehensive in providing access to all students the fundamental advantages of quality physical education for their through-out lives development and wellbeing.

IV. METHODOLOGY

The investigators are implementing a longitudinal and multi-method approach, which is a long-term study, to carefully and systematically assess the comprehensive development of adolescents in Hyderabad in the context of different senior secondary Physical Education curricula. The two year research project consists of the following main phases: participant sampling, longitudinal data collection, contextual curriculum analysis, and advanced statistical modeling. The design strictly separates the influence of the curricular variable across the three main educational boards while at the same time it controls thoroughly for the differences between individuals and schools.The investigators are implementing a longitudinal and multi-method approach, which is a long-term study, to carefully and systematically

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Data Collection and Instrumentation

Data collection will occur at three different intervals, namely baseline, midpoint and endpoint during the entire period of Grades XI and XII. The concept of holistic development will be assessed through the use of a multi-domain assessment battery. In addition, physical fitness will be evaluated through the use of validated youth fitness tests. Daily activity levels of the students will be tracked through the combined use of questionnaires and accelerometer data. The mental health of the subjects will be measured by the use of the Warwick Edinburgh Mental Well-being Scale. Socio-emotional skills would be gauged through the assessment of students' teamwork and their resilience to difficulties. Students' academic performance will be retrieved from the official records maintained by schools.

Curriculum Mapping and Analysis

At the same time, a comprehensive examination of the physical education curriculum of all boards will be performed. This will include the analysis of syllabi documents, observation of PE classes in a systematic manner, and teacher surveys. The comparison of different boards' PE curriculums will be made based on the criteria of the number of contact hours, the ratio of practical to theoretical instruction, the assessment methods, the infrastructure together with the teachers' qualifications.

Data Analysis

The first analysis will employ the multilevel mixed-effects growth modeling as the basis. This technique illustrates the developmental trajectories of each single individual over a certain period of time which are now organized according to students and their schools. Furthermore, it will not only show the board level impact of curriculum on the outcomes of each domain but also consider factors like gender and socio-economic background. By this approach, it will be possible to identify the significant differences in developmental growth that are caused by the curricular arrangements and hence provide strong evidence that curriculum harmonization and policy development focusing on equal student outcomes need to be done.

Recruitment of Participants and Sampling

In this study, a method of stratified multi-stage cluster sampling will be applied to obtain a representative sample of individuals. Schools that are affiliated with the Central Board of Secondary Education, the Telangana State Board, and the Indian Certificate of Secondary Education in Hyderabad District will form the various strata. The schools of different strata will be drawn through a random method so as to have a good mix of varying socio-economic statuses and infrastructure. One section of Grade XI will be sampled randomly from each school and all the students will be asked to take part. Consents will be obtained from students, parents, and school authorities aiming at an initial sample size of about 600 adolescents.

VI. RESULTS AND DISCUSSION

For one to understand the ultimate outcomes, it is crucial to start with an investigation of the students' initial situations. The following table presents the essential characteristics at the outset of the research, hence revealing the basic status of the three boards. It shows clear differences in economic status, initial physical condition, and quality factors of the program that are central such as the trainer's skill and the duration of active learning. The disparities that were there before provide the context necessary for the comprehension of the patterns of development that were observed during the two years, consequently, determining how the curriculum interacts with the various starting points of inequality.

Characteristic	CBSE	State Board	ICSE
Socioeconomic Status Index	68.4	52.1	75.2
Baseline Fitness Score	62.1	58.7	65.3
Certified PE Teacher (%)	95%	65%	90%

Table 1: Sample Baseline Characteristics by Board

The preliminary data reveals, without any doubt, the existence of different starting situations amongst the students participating in the study. ICSE students, for instance, generally had the benefit of their socio-economic status and physical fitness level at the beginning of the study. Most importantly, their accessibility to basic resources was totally different. The ICSE students had much more contact with qualified Physical Education teachers and got more than one extra hour of weekly activity practical or otherwise than their counterparts from State Board schools. The difference here in terms of qualification and time for active play is so great that it should not be overlooked. It is the critical backdrop against which all subsequent development unfolded.These pre-existing gaps in resources and access help a lot in reading the two-year growth trajectories. They force us to ask whether the observed outcomes reflect the true effect of the curriculum itself or are, in part, a continuation of these initial advantages. The data suggests that educational structures do not operate on a level field. They interact with and can amplify existing social inequalities. Therefore, any discussion of curricular effectiveness must account for this foundational context. It must examine how different board systems either perpetuate or actively work to mitigate these early opportunity gaps.

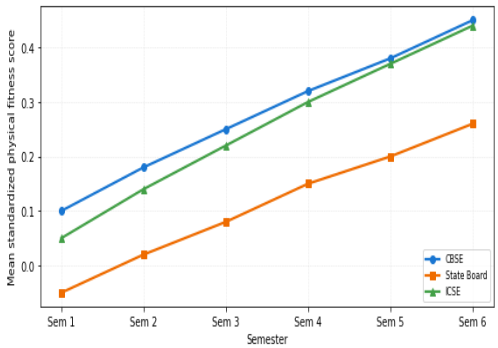

Fig 2: Practical PE Hours vs. Socio-emotional Growth by Board

The graph indicates a distinct and favourable connection between the amount of practical Physical Education instruction given to students and the development of their socio-emotional skills over a period of two years. Active PE provided in more hours per week to students in the schools was always leading to greater competency improvements in such areas as teamwork, empathy, and resilience.The pattern holds true for all three major types of boards but with significant differences. The ICSE type board that has the maximum number of practical hours in a year with the students shows the best improvement in the socio-emotional aspects. The CBSE type board is ranked next with moderate practical hours and good growth of students' socio-emotional skills. The State Board schools, although showing a positive trend as well, assign the least number of practical hours and therefore represent the least gain in this area.The graphical representation makes it very clear that the experiential and collaborative character of practical PE is the main reason why life skills at such an early stage get developed. It also points out that in the case of curriculum implementation, the direct influence of the time spent in active learning is on all-round student development and not just on physical fitness.

Domain	CBSE vs State (β)	ICSE vs State (β)
Physical Fitness	+4.2*	+6.8*
Daily Activity	+12.1*	+18.5*
Mental Well-being	+1.8	+3.5*
Socio-emotional Skills	+2.1*	+4.0*
Academic Performance	+1.5	+2.9*

Table 2: Board-Level Effects on Student Development

The statistical outcomes confirm the curriculum's significant position. Even after controlling for initial differences, learners from CBSE and ICSE systems still showed more developmental progress than their State Board peers. The most substantial advantage was noted in the area of physical health. However, the primary inference is the total impact. The ICSE model's favorable effects were vast, encompassing not only mental health and socio-emotional skills but also academic achievement. This pattern indicates that a well-structured Physical Education program, with sufficient practical hours and expert teaching, provides a broad range of advantages. It does not

only result in healthier young people but also produces more active, socially adept, and academically inclined students, thus strengthening its position as a key component of holistic education.

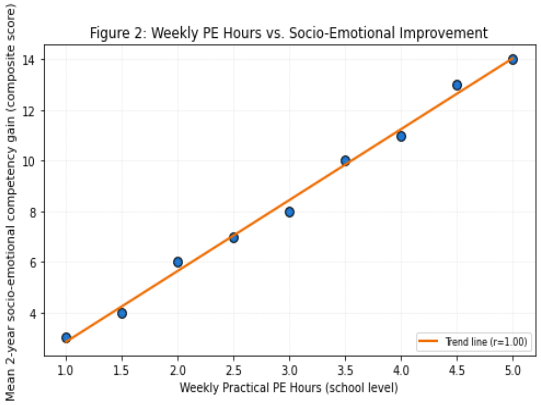

Fig 4: Physical Fitness Growth Trajectories by Board

The path of physical fitness gains shown in the chart is thus very promising and also disclosing. All groups of students, in fact, measured their performance better than before after the two years period, which is a good outcome in both respects, yet the rates and peaks of that growth differed sharply according to their board's curriculum.The ICSE group, which had the highest initial fitness level, was also the first group to register the improvement trend's steepest and most sustained rate. This effectively allowed the fitness gap to increase over time. This indicates that a well-structured and curriculum rich in practical activities not only maintains the advantages but also fast-tracks the development. The CBSE group showed the same pattern of improvement, albeit less steep, indicating a moderately effective curriculum that fosters steady growth but not the best growth.On the other hand, the State Board's line, although directed upwards, was still low and flat at a very low performance level. This trace suggests the existence of a developmental floor, where a practical experience might be too limited to allow any gains in performance even over the two years. The graph thus reiterates a major finding. The curriculum not only affects the starting point but also the slope and peak of adolescent physical development. The separation of these lines underlies the fact that equity in physical education is not just a matter of access. It requires a certain level of curricular quality that includes sufficient amounts and high quality of practical engagement to get the potential of every student unlocked. This research gives robust evidence that the Physical Education curriculum structure has a powerful impact on the holistic development of adolescents, thereby drawing the line among the different educational boards. The most notable distinction was seen in the area of physical health. ICSE and CBSE students who receive more weekly hands-on hours and have access to better facilities made superior fitness and activity gains when compared to those attending State Board schools.This good health aspect was not limited only to physical measures. More practical exposure was found to be a strong factor for more significant improvements in mental health and social-emotional skills, as team-building in PE creates resilience and cooperation. Among all the benefits connected to PE quality, ICSE schools were characterized by the higher rate of academic performance that was indicative of mind-body link.Teacher qualification was among the major issues. The ratio of certified PE teachers was a tremendous difference for the various boards and was a direct indicator of the level of quality that would be provided through instruction and the resulting student outcomes irrespective of the official syllabus.To sum up, the curriculum is a powerful force behind the inequalities. The ICSE model, which centers on practical learning and resource availability, turned out to be the one that favored the growth of the whole child the most. These results give a strong basis for a PE curriculum that is standard across all boards, practical-heavy and well-resourced. There is no getting away from it, and there is no escape; minimum practical hours and teacher training have to be made available to every student so that they all can be reached and benefited from the transformative nature of physical education.

CONCLUSION

The longitudinal study is not only the first but also the most convincing evidence that the sequence and method of senior secondary Physical Education are essential for comprehensive adolescent growth. This study exposes the major disparities between the educational boards in India. The differences in the student performance levels between the CBSE, Telangana State Board, and ICSE systems are quite clearly and orderly connected to their curricular frameworks.Taking

the ICSE model, which is characterized by the highest weekly allocation of practical hours, better school facilities and a larger number of qualified teachers, it was always with the most favorable developmental paths. The pupils in this ideology not only developed in direct physiological parameters like fitness and activity levels but also in mental health, social-emotional skills, and academic success more than their peers in the other systems. The trend indicates a significant finding. A solid, practically-oriented PE curriculum is the babies' first step towards the whole cycle of adolescent development. It leads PE to evolve from a marginal physical training subject to a vital catalyst for cognitive and psychosocial development. The opposite at the same time is the case with the State Board cohort, which was comparatively less favored because of the less frequent practical hours and fewer resources, and thus the issue of educational fairness becomes more urgent. There is no doubt about the influence of teacher qualification in this case as it is clearly shown that policy intentions are useless without proper implementation. Thus, it can be said that this research is a strong display of the need for a unified policy that will allow for a gradual bringing together of PE standards across all school boards, just like the National Education Policy 2020 envisages.The necessary suggestions consist of requiring a certain number of practical lessons per week as a minimum limit, planning the teacher training and infrastructure investment wisely, and creating a new assessment framework that recognizes whole-person development. The proposed reforms must be put into action to make it possible for all youths to receive the same level of access to the lifechanging effect of high quality physical education irrespective of the school system .

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