Chapter 1

INTRODUCTION
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A. General Introduction

Sports has become a part of human life and living. It has also become an important part of the social and cultural profiles of many societies around the world. The world realize the contribution of sports as a factor for sustainable development, peace keeping and international understanding and cooperation. Sports development cooperation is part of cultural development cooperation. Development is used to refer to a social process of change in which the economic, social and human conditions of life of the majority of the population are improved. In such cases, sports development cooperation professes clear sociopolitical goal. Top performance sport had provided hitherto unsuspected possibilities of commercial enrichment and for the self-glorification of nationalistic propaganda (Roy and Sankar, 1996). Sports for health is indisputable. Sports for fun and recreation are acceptable. Sports for profession is a trendy position indeed. In the 20th century sports has occupied a dominant position in the area of human interest and in the 21st century the dimension will further increase. The sports selections of the newspapers are growing. Sports takes more time on radio and television. Electronic and print media have brought sports to the larger section of the population.

Physical prowess and ability in sport have been highly prized attributes throughout history. If sports and exercise create a healthy self-awareness a reduction in the incidence of smoking, obesity and alcoholism could reasonably be expected in people who exercise. These habit changes alone would prevent premature death in many. However, more positive evidence exists that exercise has a direct influence in maintaining health in all age groups. At any age physical activity has dramatic effects on physiological function of the body. Beside these some mental improvements such as, improved academic performance, judgment etc. and psychological and social objectives such as, improved self-confidence and self-esteem, promotes healthier lifestyles etc. can be achieved by sports programs (Lumpkin, 1994). So the real fact is that regular physical activity and exercise can contribute to optimal health and wellness.
Participation in sports is one of the common traits of human character and it starts to develop from the very beginning of childhood. But with the development of age some people participate in recreational sports or amateur sports where as very few individual dedicate themselves to become true sports persons by regular practice and training which enable them to improve their psychological adjustments towards their goal. However, the basic physiological parameters are cardiovascular and respiratory adaptation, haematological changes, development of autonomic reflexes, maintenance of rhythmic endocrine orchestra, proper body build up etc.

Children mature at varying rates, exhibiting considerable variation within the same chronological age group. Physical activities should be appropriate for the stage of physical and psychological development of the individual child. Regular participation in at least 3 hour per week of sports activities and competition on top of the compulsory physical education program is associated with increased physical fitness, lower whole body and trunkal fat mass in prepubertal boys (Ara et al., 2004). Physical growth pattern of boys and girls depends on genetic, nutritional, socioeconomic factors and environmental factors. Anthropometric parameters are highly associated with physical fitness parameters (Chatterjee et al., 1993). The characteristics of an athlete mainly depend upon physical fitness having components like muscular strength and endurance, cardio-respiratory endurance, flexibility, speed, power, agility, balance etc. But these components may vary in sports persons involving different sports activities. The average values of maximum oxygen uptake (VO₂max) for the toplevel soccer players tend to be high, supporting the belief that there is a large contribution from aerobic power to playing the game. On the other hand, of 400 and 300 m running, a high anaerobic power coupled with good running technique may allow an athlete to be more relaxed at race pace (Reilly et al., 1990).

The interaction of these physical fitness components under a wide range of condition like genetic inheritance, morphology, environment, personal interest and habitual physical activity also play an important role in sports performance. With exercise and sports competition, acute need for nutrients will change. Energy needs also increase because of the elevated energy expenditure with physical activity. An increased intake of
food naturally occurs to accommodate the day-to-day nutrient needs of young athletes, and unlike non-athlete, young competitors typically come closer to meeting their requirements for micronutrients (Petrie et al., 2004). A study conducted in Kolkata revealed that motor performance of football players and sprinters was affected by nutritional status of them (Chatterjee et al., 2005c). Genetic and environmental influence on physical and motor fitness measurements has also been established (Chatterjee and Das, 1995).

Many investigators have investigated the effect of living environment on physical fitness components (Htay et al., 1976; Ozdirenc et al., 2005; Ringsberg, 1993). However, even fewer studies are available which dealt with the assessment of physical fitness components in different environmental air pollutant zones. Das et al. (2005) studied the motor ability variables of school-going boys in two different air pollutant zones.

Epidemiological data have identified individual components of air pollution or pollution collectively, as parameters of cardiovascular and respiratory disease (Pope et al., 2004). Some compounds are also known or suspected carcinogen (Boffetta et al., 1997). The health effects of growing child of longterm exposure to a polluted atmosphere are of deep concern. Delfino et al. (2003) showed that air toxics in the pollutant mix from traffic and industrial source might have adverse effects on asthma in growing children of 10-16 years old. Yu et al. (2004) reported the adverse effect of air pollution on VO₂max in children and suggested that physical exercise in a polluted environment might not have beneficial effect on cardiopulmonary fitness. Pierson (1989) reported adverse effect of air pollution on athletic performance during training and competition.

During aerobic exercise, even at relatively low intensities, inspired air is taken in predominantly through the mouth, and there is a major increase in minute ventilation and diffusion capacity. These factors augment the respiratory uptake of airborne contaminants, with increased penetration to the lower gas-exchange regions of the lung. Indeed, the total amount of ultra fine particulate matter deposited in the respiratory tract of humans during moderate exercise has been shown to be about five times that at rest (Daigle et al., 2003).
As would be expected, when the concentration of pollutants increases, so too does the amount of inhaled matter. Thus, habitual exercise in highly polluted localities, such as alongside busy roadways, may increase the overall intensity, during and frequency of exposure, all of which are relevant to the evaluation of an individual’s risk profile for disease (Kunzli, 2002).

It is an unquestionable fact that regular physical activity is beneficial to health and longevity. Accordingly it is common practice for physicians and other health care professionals to encourage exercise. However, people exercising in urban regions may be unwittingly at risk because of exposure to concentrated automotive pollution, a known risk factor for cardiovascular and respiratory disease. The physiological changes that occur during exercise probably act to compound the toxic effects of environmental air pollution. People should not be deterred from regular exercise as it is of known benefit, but during exercising they should avoid areas with high pollutant concentrations (Sharman, 2005).

Automotive exhaust comprises a heterogeneous mixture of suspended particles and gases, the most common gases being sulphur dioxide, nitrogen dioxide, carbon monooxide and ozone. Unburnt fuel emits volatile organic compounds (eg. Benzene, toluene) and the fuel combustion process liberates many thousands of chemicals in addition to particulate matter (PM) of varying size and composition. Ultra fine particulate matter, with an aerodynamic diameter <0.1µm, is thought to be particularly harmful to health, as it is readily inhaled and absorbed into the circulation (Nemmar et al., 2002).

Harmful effects on the body from pollutants are multifactorial, with acute or chronic exposures increasing the cellular processes associated with atherogenesis (the underlying cause of most cardiovascular disease), impairing pulmonary function, provoking local and systemic inflammation, disrupting cardiac autonomic control and inducing vascular dysfunction (Sharman, 2005). Deleterious health effects may result from exposure to pollutants at concentrations that are lower than recommended air quality standards (Samet et al., 2000). Indeed, research to date has failed to determine a “threshold” limit for which there is no adverse health effect (Kunzli, 2002). In general, most analyses of
the physiological effects of air pollution find an exposure-dependent relationship that crosses socioeconomic boundaries and poses a significant threat to everyone’s health. Importantly, certain populations may be particularly vulnerable to the effects of polluted air, such as children (Committee on Environmental Health, 2004), people with asthma (Sheppard et al., 1981), diabetes (Zanobetti and Schwartz, 2001) or acute lower respiratory disease, frail and elderly people with pre-existing heart and lung conditions (Goldberg et al., 2001).

Air pollution in the urban centres in most of the developing countries has reached alarming levels. India is no exception. Indian metro cities and major towns are burdened with emission from old industries and exponentially increasing number of automobiles. Most of the automobiles plying in the Indian cities are old, ill-maintained and are not equipped with technology for reducing emission from such vehicles. The predominance of diesel driven public transport systems, transport vehicles, two stroke two wheelers and three wheelers are all responsible for very high emission of air pollutants particularly particulate of respirable size and various air toxins (Department of Environment, Government of West Bengal and West Bengal Pollution Control Board, 2002).

Vehicular pollution is no longer just an intangible threat in cities like Delhi, Mumbai and Kolkata - as the air grows perceptibly darker. A comparison of the air quality data of different metros of India indicate that the air pollution level of Kolkata is higher than other metros and is only close to Delhi (Table 1.1 & 1.2, Fig.1.1).

Table 1.1: Average annual levels (µg/m³) of three major pollutants in the year 1995

<table>
<thead>
<tr>
<th>City</th>
<th>Suspended particulate matter (SPM)</th>
<th>Sulphur dioxide (SO₂)</th>
<th>Nitrogen dioxide (NO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumbai</td>
<td>209.8</td>
<td>31.1</td>
<td>34.2</td>
</tr>
<tr>
<td>Kolkata</td>
<td>354.3</td>
<td>35.7</td>
<td>29.9</td>
</tr>
<tr>
<td>Delhi</td>
<td>410.5</td>
<td>23.5</td>
<td>47.2</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>251.2</td>
<td>32.0</td>
<td>18.8</td>
</tr>
<tr>
<td>Kanpur</td>
<td>463.2</td>
<td>14.0</td>
<td>15.9</td>
</tr>
</tbody>
</table>

*Source: The Citizen’s Fifth Report, 1999, Part II: Statistical Database*
Table 1.2: Annual average levels (µg/m³) of major pollutants in the year 1998

<table>
<thead>
<tr>
<th>City</th>
<th>Respirable particulate matter (RPM)</th>
<th>Sulphur dioxide (SO₂)</th>
<th>Nitrogen dioxide (NO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumbai</td>
<td>135</td>
<td>18</td>
<td>23</td>
</tr>
<tr>
<td>Kolkata</td>
<td>165</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Delhi</td>
<td>171</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>Kanpur</td>
<td>--</td>
<td>17</td>
<td>23</td>
</tr>
<tr>
<td>Chennai</td>
<td>78</td>
<td>12</td>
<td>19</td>
</tr>
</tbody>
</table>

Source: Air Quality Status & Trends in India by CPCB (NAAQMS/14/1999-2000) & WBPCB

However, the present status of air pollution of Kolkata should be highlighted. Though industries, thermal plants and domestic activity also contribute to air pollution in cities, the transport sector is the largest emitter of air pollutants. Projected emission from various sources in Kolkata for 2000 was 3,53,000 tons. Of this, transport sector contributing 50% is followed by 48% by the industrial sector. Domestic sector contributes the balance (Department of Environment, Government of West Bengal and West Bengal Pollution Control Board, 2002) (Fig1.2).

Under the above findings, people living in Kolkata are equally prone to high level of risk from the auto exhaust pollutants - one may presume.

Department of Environment, Government of West Bengal and West Bengal Pollution Control Board (2002) reported citizens of Kolkata showed higher prevalence of respiratory symptom complex (RSC) than rural subjects. Their results showed that 45% of rural individuals (90 out of 200) had some form of RSC. In contrast, three fourth of urban individuals (970 out of 1310) exhibited RSC. Thus, people living in Kolkata experienced 65% more respiratory problems than their rural counterparts and that rural areas, namely Burdwan, Midnapore, Birbhum and 24 parganas (south) district of West Bengal where pollution level was expected to be much less due to negligible numbers of automobiles and absence of factories.
Fig. 1.1: Levels of Air Pollution in Seven Major Cities in 2001

(Annual Concentration)


RSPM = Respirable suspended particulate matter

PM = Particulate matter, NOx = Oxides of nitrogen

Fig. 1.2: Air Pollutants Load (Per year) from Vehicles in 2001

So, this in-depth analysis attempts to represent a comparative study of physical fitness between boys who are occupationally exposed to a spectrum of noxious chemical in two different amounts.
B. Aim and Objectives

The aim and objectives of the entire study are:

1. To investigate the impact of different sports activities on physical fitness components of school-going boys and to what extent game specific training influenced those components.

2. To frame out the current status of air pollution of two areas in West Bengal.

3. To compare physical fitness components (PFI, aerobic power, anaerobic power, flexibility, agility, leg muscle power, speed, hand grip strength and hand muscle endurance) of junior sports persons and untrained boys of two different areas.

4. To study the relationship between air pollution and physical fitness components of school-going boys of those areas.

5. To assess the nutritional and health status of school-going boys of two areas.

6. To evaluate and investigate whether environmental air pollutants have any effect on nutritional and health status of those boys.

7. To investigate whether any difference of nutritional status can affect the health status and performance of athletes against the pollutants.

C. Delimitation of the study

The study was delimited to the following factors:

1. Selected anthropometric, physical and physiological variables and selected physical fitness components were chosen for the present study.

2. This is an attempt to frame out the ambient air quality level of two areas in West Bengal.

3. Subjects participated in this study lived and were accustomed to be trained in those two areas.

4. All the sports persons subjected for this study were under regular training for a minimum period of three years. Untrained boys were not under any regular practice or training.

5. Higher and lower pollutant zones were selected on the basis of air quality data collected during the winter season.
D. Limitation of the study

1. Among various environmental conditions the present study was limited to ambient air quality of two different zones in West Bengal. Other aspects of environmental conditions like temperature, altitude from sea level etc. were not included in this study.

2. Due to lack of instrument and financial support monitoring of the ambient air quality throughout the whole year was not possible and among all air pollutants suspended particulate matter (SPM), respirable particulate matter (RPM), sulphur dioxide (SO₂), oxides of nitrogen (NOₓ) as nitrogen dioxide (NO₂) were measured. Due to lack of sufficient air quality data of one area, data of only three months of winter season in that area have been presented. Air pollutants concentration is increased and is higher in winter season than other season.

3. The present study was limited to three different sports disciplines.

4. This study was limited to two areas of West Bengal. So sample size was small for sports persons specially for badminton players.

5. Psychological variables were considered as another limitation of the study.

6. The tests and measurements on selected variables were conducted in both regions under the environmental temperature 23-32°C and humidity 60-78%. Thus, it may be assumed that environmental temperature and humidity would not affect the performance level between the subjects of two areas.

7. Among all nutrients energy, carbohydrate, protein, fat, calcium, iron, β-carotene, vitamin C, vitamin B₁ intakes were calculated.

E. Hypothesis

On the basis of the review of literature, discussion with the experts and also the investigator’s own perception of the problem, it was hypothesised that the selected anthropometric, physical, physiological variables and selected physical fitness components of this study would not have significant relationship with nutritional status and ambient air pollution.