

Medicine, science and sport

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To understand the explosive development of the international sports movement, consideration must be given to a number of historically unique changes that have occurred during the past century. Some of these changes are of a social nature, others were engendered by the revolutionary advancements of science and technology. The result is the establishment of standards of growth, health and fitness such as have never before existed.

Child Labour

Until the end of the last century child labour existed throughout Europe. It represented a curse- that had originated with the invention of machinery. A horde of workless, starving vagrants flocked from the countryside into the towns. Children were driven by the poverty of their parents into factories and mines. Child-slaves, orphaned and friendless, were supplied in droves by the workhouses to employers. Children of ten, of seven, five and even of three, spent twelve hours at a time in the darkness of the mines. Lord Shaftesbury was among the most active proponents of reforms. "Never", he said in a parliamentary debate on child labour in the House of Commons, "have I seen such a display of selfishness, frigidity to every human sentiment, such ready and happy self-delusion". In 1859, children of less than ten as well as girls and women were excluded altogether from the mines. But it was not until 1875 that boy chimney sweepers were prohibited. The seventies saw compulsory free education established throughout Great Britain and thus a barrier was interposed between children and the factories. In the same decade the first kindergartens were introduced. The Society for the Prevention of Cruelty to Children, founded in 1872, took the initiative in promulgating progressive social legislation. It goes without saying that children until then had been in poor health, neither willing nor able to engage in sport.

Leisure

To understand why, during the past decades, sport has become one of the major leisure pursuits of mankind, it must be realised that the concepts of both leisure and sport have only recently assumed their present meaning. The idea that time for leisure would be avail-

able to the common man sounded revolutionary not so long ago when the worker, unless he was working, rested to recuperate from and gather new strength for work. The boys and girls who slaved in coal mines and textile mills around the middle of the nineteenth century had neither the time nor the strength to play. Their, as well as their elders', situation was incomparably worse than that which had prevailed during the preceding millennium in the relatively stable predominantly rural village environment throughout Western Europe.

Health

That medicine would ever become a science was beyond imagination until not so long ago. To exemplify this, reference is made to the gorgeous portrait of Louis XIV (1638-1715) by Hyacinthe Rigaud. It shows the Grand Monarque in his ermine-lined robes of state, sceptre in hand, arm on hip, gazing out on the world with affable condescension and consummate pose. We see the epitome of majesty ; grace, dignity, command. It is a disillusioning experience to turn to the King's private life as described by his doctors. A new and disconcertingly human figure emerges, a man plagued by chronic infirmities of all kinds ; pestered by doctors and surgeons ; subjected to incredible purges, enemas, and emetics. The health of even the humblest citizens today is infinitely better protected than that of 'The Sun King' 300 years ago. Throughout his reign Louis XIV was attended by three premiers médecins' who kept a "*Journal de la Santé du Roi*". It describes the illnesses of the royal patient : "*rheumatism, vapours, humours, fistula, insomnia, indigestion, fluxes, headaches, chronic fevers, anthrax, melancholy, urinary difficulties, night sweats, vertigo, erysipelas, colic, bile, acid mouth, chronic toothaches, and inevitably, a great deal of gout*"; It is not difficult to understand why, as his biographer Philippe Aries mentions, "*Louis XIV showed a marked lack of enthusiasm for tennis*".

Recruits 1790-1810

In order to assess the extent to which physique, strength and fitness of the present generation of youths in the United States and Europe has benefited from the advancements of science and technology, one must evaluate documentary evidence concerning the status of young people two centuries ago. A book entitled "*The Enlisting, Discharging and Pensioning of Soldiers During the Years 1790-1819*", published in 1839 by Henry Marshall, Deputy Inspector-General of British



1924 : P. Nurmi... 3:53.6.

Army Hospitals, describes that the 100,000 men who during that period enlisted on a long service contract of 21 years were a miserable lot: for a regiment, recruited in 1797 at Cork for embarkation to Buenos Aires, minimum weight was 116lb 9 oz (52 kg), minimum height 5ft 5½ in. (1.66 m). Every recruit who complied with these standards was accepted, irrespective of his age. In the French Army minimum weight was 110lb (50 kg), minimum height 5ft 2 in (1575 m). Ten percent of today's US schoolboys of 12 years of age would thus have qualified for acceptance ! Every conceivable disease-epilepsy, palsy, insanity, rheumatism, hernia, blindness, ulcerations-was either stimulated or intentionally reproduced in attempts to get out of the army. Nor did lashes deter malingerers from their set purpose. Hernias were produced by incising the scrotum, inserting the stem of a clay pipe and with the assistance of a friend, blowing until the skin was as tight as a drum. Men were quite prepared to lose the sight of one eye if it could get them their discharge. This was done by the application of a caustic, by scraping the surface of the cornea, or by piercing it with a sharp needle and scratching the lense to cause cataracts.

Nutrition

The conquest of hunger and malnutrition is but a recent triumph of science. The role of vitamins as essential elements of a good diet was unknown until the beginning of this century. In 1913 Sir John Boyd-Orr assessed the incidence of rickets in Glasgow, Scotland : 40 % of the city's school population were found to be afflicted. In a repeat survey in 1936 only 10 % of the children in Glasgow had rickets : Vitamin D had been identified by Adolf Windaus of Goettingen who was awarded a Nobel Prize in 1928. The Glasgow study was repeated once more in 1965 when

not a single case of rickets was found among children born in Glasgow. However, the incidence of rickets among Asian immigrants to England today is comparable to what it had been in Glasgow in 1913. Malnutrition is still widespread in Asia and Africa ; while in the affluent societies obesity has become a major health problem.

Infectious Diseases

The greatest single contribution of medical research to society has been that it has brought infectious diseases under control. In 1900 infectious diseases were responsible for most deaths in the United States. Throughout the preceding centuries no family was spared the sorrow of children dying from 'fevers'. In his Johann Sebastian Bach Memorial Lecture delivered at Hamburg in 1950, Paul Hindemith mentioned that Bach lost 11 children during his life. Today few children die during infancy. The chief causes of death in the US are no longer infectious diseases but cardiovascular afflictions, malignant tumors, accidents and crime. The length of life has increased from 48 in 1898 to 70 years today. Whooping cough, diphtheria, smallpox and polio were brought under control only after World War II.

Acceleration of Growth

It is against the background of changes such as those above that the favourable status of children today must be assessed. Today's boys and girls are taller and stronger than their parents and grandparents. An average sized high school boy aged 17 does not fit into the armour of Elizabethan knights in the Tower of London. There has been a steady '*acceleration of growth and maturation*' over the centuries with a noticeable spurt during the past decades. One manifestation of this spurt is the appearance today of children and adolescents in sports such as swimming, gymnastics, ice-skating, and other athletic disciplines. Children nowadays run the 26 mile marathon, climb the highest mountains, and participate in long distance ski races. In 1979 two twelve year old boys swam the British Channel ; at the Pan-African Track and Field Games in Nairobi in July 1979 a 12 year old girl won the 1,500 m final against adult competition.

The corresponding opposite to the '*acceleration of growth*' is a '*deceleration of aging*', a phenomenon which represents the physiological basis for the participation of large numbers of senior men and women in a great variety of sporting events. At the Olympic Games in Montreal in 1976, more than 400 athletes of over 40 years of age entered the

competitions, several of them with conspicuous success...

Women in Sport

The athletic status of women reflects the far reaching changes that have taken place in the Western world during this century. The unfolding of the "power potential of the 'Second Sex'" is still in progress even though the scientific evidence on women's physical performance capacities had been available long before it was applied in practice.

"A horse sweats, a man perspires, but a lady only glows". This statement illustrates the general attitude towards exercise and athletics for girls during the Victorian age. Since then, social attitudes have undergone profound changes. During the past 50 years, millions of girls have indulged in sports, gymnastics and games; competed in swimming, in track and field events and in horseback riding ; have climbed many of the highest mountains and swam through a thousand rivers and lakes. They have derived therefrom some of the most valuable experiences of their lives. All the evil ghosts of whom they had been warned remained conspicuous by their absence. The women did not develop 'a masculine appearance' ; most of them married and had children ; none has suffered moral or physical damage or 'overstrain' from muscular exertion ; their hearts have not been 'weakened through athletics'; and most of them attain a ripe old age.

That the present generation of women grows stronger; that their physical maturation is better balanced; that their appearance has become more attractive; that the state of health of young mothers and of their children today is superior; that physically active women no longer look old at the age of 30 : that many school girls play on the same team as their mothers ; all this is, at least in part, the result of the interest now taken in the physical education of girls. Sports and games and athletics for women are significant elements of what is best in contemporary culture.

The role of women in sport was discussed in antiquity. In Chapter XV of Plato's *Republic*, entitled "*The Equality of Women*", Socrates raises the question whether "*females should guard the flock and hunt with males and take a share in all they do, or be kept within doors as fit for no more- than bearing and feeding their children while a/ the hard work is left to the males*". Socrates' brother Glaucon agreed that "*women are expected to take their full share, except that we must treat them as not quite so strong*". The two disputants con-

curred that both men and women ought to receive the same upbringing and education. Such a system, Socrates remarked, would at first appear revolutionary. But he reminded his friend that "*if is not so long since the Greeks thought it ridiculous as well as shameful for men to be seen naked in the gymnasium. When gymnastic exercises were first introduced in Crete and later in Sparta, the cynics had their chance to make fun of them*". But, he observed, "*a new attitude was soon accepted and it will be the same once women are given equal access to physical education*".

However, Plato was concerned with the education of an elite, a selected group of leaders of proven excellence of character, of mind and of body. Thus he argued logically that once the principle of selection is recognised and the wide scope of individual differences among men as well as women accepted, a distinction between the educational systems for boys and girls is no longer justified.

The fact that well trained women athletes are superior to untrained men in all branches of sport signifies a revolutionary change in society's attitude towards the female sex. Views held until recently according to which menstruation, pregnancy, child bearing, and menopause exclude females from participation in sport have been shown to be false.

In several athletic disciplines women's performances at present are equal to those of men. In terms of aesthetic criteria women athletes rank above men, e.g., in gymnastics and ice skating. The magnitude of physical educability of women is much greater than had been assumed until recently: A young woman became champion of the State of Washington in weight lifting in the flyweight class (52 kg) winning the event against male competitors ; few if any men could have beaten Olga Korbut and Nadia Comaneci on the uneven parallel bars and the balance beam in 1972, 1976 and 1980. The 400 m running world record of 48.6 seconds established by Marita Koch in 1978 is certainly remarkable. At the 1924 Olympic Games in Paris, Nurmi won the 1500 m race in a time of 3:53.6 minutes In 1980, the Soviet athlete Tatyana Kazankina established a new world record for women over the same distance with a time of 3:52.5. At several Marathon races held in the US in 1978 over 1,000 women started ; 96 % of them finished. The current women's world record of less than 2½ hours is about equal to or faster than most Olympic winning times by men prior to World War II. Most of the best women athletes in 1980 would have won the respective track and field events for

men at Olympic Games a few decades ago (Marita Koch 400 m 48.6) ; Tatyana Zelentsova (400 m hurdles 54.89) ; Evelin Jahl (discus 70.72 m) ; Ruth Fuchs (javelin 69.16 m) ; Sara Simeoni (high jump 2.01 m) ; and Rosemarie Ackerman; (1.99 m) ; Grazyna Rabsztyń (100 m hurdles 12.48) ; Johanna Klier (100 m hurdles 12.62).

Athletic Records

The chief elements from which all physical performances are synthesised have been identified through scientific analyses of athletic records. The world's best performances in sport have been documented since the beginning of this century, some of them longer. It has thus been possible to construct growth curves of world 'records for all sports events, including those held at Olympic Games. From them, the magnitude of the performance explosion that has taken place during the past decades in all branches of sport can be assessed. However, rates of performance growth differ for different athletic disciplines. In swimming, performance growth continues ; whereas in the short and middle distance track events the steep ascent of record growth curves is about to come to an end. In a few events, terminal positions have already been reached : The probability that Bob Beamon's long jump record of 29ft 2½ in (8.90 m) established in Mexico City in 1968 will be improved is not great. Altogether it is not generally realised that "the expanding athletic universe" is bound to reach its limits.

Unexplored Resources

As to the future of athletic records it must be taken into account that from the advancements of science and technology which have resulted in the conquest of hunger and the control of infectious diseases, not more than a quarter of mankind have as yet benefitted. The medical status of most of the populations of Asia and Africa today is not better than it was in Europe during the Middle Ages. The extent to which infectious diseases affect the physical status of entire ethnic groups became evident during the past 20 years in East Africa when smallpox was eradicated through the introduction of vaccination. Only then did Hamitic athletes from Tanzania, Ethiopia and Kenya appear on the international athletic scene. Their conspicuous successes at the 1972 Olympic Games established their countries as major track and field powers. Their status will continue to gain as further public health measures become effective. A world-wide upgrading of all

sports performances is bound to take place when the results of preventative and curative measures that are currently introduced by the World Health Organisation throughout the Third World become noticeable. The issue has wide implications.

Generally held beliefs that medical science



1980 : Tatyana Kazankina... 3:52.5.

has succeeded in conquering most of the great killer diseases of mankind are fallacious. In *The Listener* of 9th August 1979, Brian J. Ford pointed out that :

"We cannot yet reliably cure any virus disease and know next to nothing of the cause or the cure of a host of major scourges, from cancer and coronary heart attacks to schizophrenia, arthritis, strokes and the degenerative diseases, from cystic fibrosis to Huntington's chorea. The tropical diseases alone, from schistosomiasis and river blindness to an array of worm parasites and the trypanosomes which waste : the body, afflict hundreds of millions of people."

During the next two decades public health measures are likely to reduce the incidence of all diseases everywhere. A world-wide advancement in growth and development should thus occur and from it further improvements of all athletic records. Considering the achievements of medical research so far, such forecasts seem justified.

Technological innovations will continue to play an important role in the athletic performance explosion of our century. The introduction of Tartan tracks, newly designed javelins and 'discuses, fibreglass poles and foam rubber, mats have noticeably altered the track and field scene in its entirety. The temperature control of swimming pools, improved filtration systems, establishment of

smooth water surfaces through vertical lane markers, have facilitated the establishment of new swimming records. The availability of large indoor facilities, such as those provided in the air-conditioned Astrodome in Houston and the Louisiana Superdome in New Orleans, has opened vistas not as yet fully explored, e.g., that of creating optimal room temperatures and other advantageous environmental conditions for individual athletic events throughout the year.

Last but not least, the fact that numbers of participants in all sports are continually increasing throughout the world renders probable the appearance from time to time of "athletic geniuses" and thus the establishment of extraordinary records—the phenomenon Bob Beamon is likely to recur in other athletic disciplines even though no predictions are possible as to date and place.

The Fields Beyond

Once the limits of physical performance growth are reached, a chief objective of athletics will be to explore the aesthetic possibilities that are inherent in sport, possibilities derived from the inexhaustible choice of designs of expression and communication of human movements.

In a few decades from now, the athletic situation will be comparable to that of oil painting, in the middle of the 17th century, of the ballet prior to World War I, and of piano music during the late nineteen-twenties.

The development of oil painting extended over the better part of two centuries, starting in the 15th century with Jan van Eyck's search for a varnish which would dry without being put in the sun; his discovery was subsequently elaborated by Giovanni Bellini from whom Albrecht Dürer learned the technique he applied in his masterpiece "The Four Apostles". Oil painting reached its ultimate perfection with Diego Valázquez, Jan Breughel and Peter Paul Rubens.

The technical possibilities of the ballet were explored during the early years of our century when Serge Diaghilev presented his Ballet Russe in Paris, with Michel Fokine as choreographer, Vaslav Nijinski, Anna Pavlova and Tamara Karsavina as dancers and Picasso, Derain and Benois as 'decorators'. From it emerged Emile Jaques-Dalcroze's "Musical Calisthenics", Claude-Achille Debussy's "Dance Plays", Richard Strauss' "Josephs Legende", and, most recently, John Cranko's "Stuttgart Ballet".

Piano technique as we know it started with Beethoven's use of the hammerklavier, its

exploration through his pupil Carl Czerny who became the teacher of Franz Liszt. To Liszt's Weimar school belonged Eugene d'Albert and Ferruccio Busoni, under whose direction Egon Petri acquired the ultimate level of keyboard mastery, equalled but not surpassed by today's greatest pianists, not even by Vladimir Horowitz, Rudolf Serkin, Sviatoslav Richter and Benedetti Michelangeli.

When the history of gymnastics is written, the names of Olga Korbut, Nadia Comaneci, Nelli Kim and their teachers will rank in the chronology of the subject like those to whom the arts are indebted for the technical perfection of painting, dancing and music.

Through the unprecedented differentiation of the motor system which sport in all its manifestations is capable to accomplish, it is destined to reveal its powers of experience and communication and thus of creating a new culture, the third, if one considers the humanities and the natural sciences first and second.

The number of those who will take full advantage of this "third culture" will remain limited, just as the number of those who have in the past realised the aesthetic and intellectual possibilities derived from the arts and sciences has remained limited. The pursuit of excellence in all its forms has always been entrusted to an elite in the sense in which Lord Kenneth Clark has defined the term: "If you don't have an élite in some sense of the word—and it does not mean a class élite—and some people of superior mind and character, guiding the people then if all falls into barbarism. The general rough-and-tumble of uneducated people is not going to produce a civilization."

E. J.

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