പതിനാലാം കേരള നിയമസഭ
പതിനഞ്ചാം സമ്മേളനം

നക്ഷത്രചിഹ്നമിടാത്ത ചോദ്യം നം. 636 — 29.05.2019-ലെ മറുപടിയ്ക്ക്

കുട്ടികളുടെ കായികക്ഷമത

ചോദ്യം		മറുപടി	
ശ്രീ.കെ. ദാസൻ		**ശ്രീ.ഇ.പി.ജയരാജൻ** ബഹു.വ്യവസായവും വാണിജ്യവും കായികവും യുവജനകാര്യവും വകുപ്പ് മന്ത്രി	
(എ)	പൊതുവിദ്യാലയങ്ങളിലെ കുട്ടികളുടെ കായികക്ഷമത കുറഞ്ഞുവരുന്നു എന്ന ആക്ഷേപം ശ്രദ്ധയിൽപ്പെട്ടിട്ടുണ്ടോ;	(എ)	ഉണ്ട്.
(ബി)	ഇത് സംബന്ധിച്ച് സർക്കാർ ഏജൻസികൾ ഏതെങ്കിലും തരത്തിലുള്ള പഠനം നടത്തിയിട്ടുണ്ടോ; വിശദാംശങ്ങളും റിപ്പോർട്ടിന്റെ പകർപ്പും ലഭ്യമാക്കാമോ;	(ബി)	കുട്ടികളുടെ കായിക ക്ഷമത വർദ്ധിപ്പിക്കുന്നതിന് നിലവിലുള്ള സമ്പൂർണ്ണ കായിക ക്ഷമതാ പദ്ധതി 2008-09 വർഷം മുതൽ ആറു വർഷമായി തുടർന്നു വന്നിരുന്നു. കേരളത്തിലെ എല്ലാ സ്കൂളുകളിലും 5 മുതൽ 10 ക്ലാസ്സുകളിൽ പഠിയ്ക്കുന്ന കുട്ടികളുടെ കായിക ക്ഷമത പ്രത്യേക ടെസ്റ്റുകളിലൂടെ വ്യക്തിഗതമായി അളന്ന് പരിശോധിച്ച്, പരിശോധന ഫലം ശാസ്ത്രീയമായി അപഗ്രഥിച്ച് കുട്ടികളുടെ കായിക ക്ഷമത മെച്ചപ്പെടുത്തുന്നതിനും, അതുവഴി ആരോഗ്യമുള്ള ഒരു സമൂഹത്തെ വാർത്തെടുക്കുകയും ചെയ്യുക എന്ന ലക്ഷ്യത്തോടെ വിദ്യാഭ്യാസ വകുപ്പിന്റെ സഹകരണത്തോടു കൂടി കേരള സംസ്ഥാന സ്പോർട്സ് കൗൺസിൽ നടപ്പിലാക്കിയ പദ്ധതിയാണ് സമ്പൂർണ്ണ കായികക്ഷമത പദ്ധതി. 2008-ൽ ആരംഭിച്ച പദ്ധതി 2012-13 ന് ശേഷം ചില സാങ്കേതിക കാരണങ്ങളാൽ തുടരുവാൻ സാധിച്ചില്ല. പ്രസ്തുത പദ്ധതി ഈ വർഷം മുതൽ നടപ്പിലാക്കുന്നതിനായി 5 മുതൽ 10 വരെ ക്ലാസ്സുകളിലെ വിദ്യാർത്ഥികളിൽ കായിക ക്ഷമത എങ്ങനെ മെച്ചപ്പെടുത്താമെന്ന് പഠിച്ച് റിപ്പോർട്ട് സമർപ്പിക്കുന്നതിനായി കമ്മിറ്റി രൂപീകരിച്ചിരുന്നു.

			കൂടാതെ സംസ്ഥാന സ്പോർട്സ് കൗൺസിൽ വിദ്യാഭ്യാസ വകുപ്പിന്റെ സഹായത്തോടെ സംസ്ഥാനത്ത് കായിക വിദ്യാഭ്യാസം പാഠ്യ പദ്ധതിയിൽ തത്വത്തിൽ അംഗീകരിച്ച് ഉത്തരവായെങ്കിലും, ഇത് പ്രായോഗികമായി നടപ്പിലാക്കുവാൻ കഴിഞ്ഞിട്ടില്ല. കായിക വിദ്യാഭ്യാസം പാഠ്യ പദ്ധതിയുമായി ബന്ധപ്പെട്ട് അദ്ധ്യാപകർക്കുള്ള പഠന സഹായിയുടെ മലയാളം പതിപ്പ് തയ്യാറാക്കി ഡി.പി.ഐയ്ക്ക് സമർപ്പിച്ചിട്ടുണ്ട്. വിശദമായ റിപ്പോർട്ട് ഉൾക്കൊള്ളുന്ന മാന്വൽ **അനുബന്ധമായി** ഉൾക്കൊള്ളിച്ചിട്ടുണ്ട്.
(സി)	സ്കൂൾ പ്രായഘട്ടത്തിലെ കുട്ടികളുടെ കായികക്ഷമത വർദ്ധിപ്പിക്കുന്നതിന് പ്രത്യേക പദ്ധതികളോ പരിപാടികളോ ആസൂത്രണം ചെയ്യുമോ;	(സി) & (ഡി)	കേരളത്തിൽ സമ്പൂർണ്ണ സാക്ഷരത കൈവരിക്കുന്നതിനു വേണ്ടി ആരംഭിച്ച കേരള സാക്ഷരത മിഷന്റെ മാതൃകയിൽ കേരളത്തിലെ എല്ലാ ജനവിഭാഗങ്ങൾക്കും കായിക ക്ഷമതയും നല്ല ആരോഗ്യവും കൈവരിക്കുന്നതിന് ആവിഷ്കരിച്ചിട്ടുള്ള പദ്ധതിയാണ് "കായികക്ഷമതാ മിഷൻ". ടി പദ്ധതിയുടെ നടത്തിപ്പിനായി കേരള സമൂഹത്തെ നാലായി തരം തിരിക്കുന്നതാണ്. ➢ നഴ്സറി തലം മുതൽ 4-ാം ക്ലാസ്സ് വരെയുള്ള വിദ്യാർത്ഥികൾ ➢ 5-ാം ക്ലാസ്സ് മുതൽ പ്ലസ് ടു വരെയുള്ള വിദ്യാർത്ഥികൾ ➢ യൂണിവേഴ്സിറ്റി തലത്തിലെ വിദ്യാർത്ഥികൾ ➢ യുവജനങ്ങൾ മുതൽ മുതിർന്ന പൗരന്മാർ വരെയുള്ളവർ പ്രസ്തുത പദ്ധതി സ്കൂളുകൾ, കോളേജുകൾ, സർവ്വകലാശാലകൾ, തദ്ദേശ സ്വയംഭരണ സ്ഥാപനങ്ങൾ എന്നിവ വഴി നടപ്പിലാക്കാനാണ് ഉദ്ദേശിക്കുന്നത്. ഇതു സംബന്ധിച്ച് നടപടികൾ അന്തിമഘട്ടത്തിലാണ്.
(ഡി)	ഇതിനായി കായികക്ഷമത മിഷൻ രൂപീകരിക്കുമോ; വിശദാംശങ്ങൾ ലഭ്യമാക്കാമോ?		

സെക്ഷൻ ഓഫീസർ

TOTAL PHYSICAL FITNESS PROGRAMME

TOWARDS A PHYSICALLY FIT
&
HEALTHY KERALA

TPFP

SPORTS FOR ALL - HEALTH FOR ALL

TEST MANUAL

KERALA STATE SPORTS COUNCIL

TOTAL PHYSICAL FITNESS PROGRAMME

Towards a Physically Fit
&
Healthy Kerala

KERALA STATE SPORTS COUNCIL

Conducted by
KERALA STATE SPORTS COUNCIL

Sri. M. VIJAYAKUMAR
Minister for Law, Parliamentary, Sports & Youth Affairs
Govt. of Kerala

Dr. G. KISHORE
Director, Dept of Sports &
Secretary, KSSC
Youth Affairs, Govt. of Kerala

Sri. T. P. DASAN
President
Kerala State Sports Council
Govt. of Kerala

TOTAL PHYSICAL FITNESS PROGRAMME

Towards a Physically Fit
&
Healthy Kerala

TEST MANUAL

BY

Dr. T. I. MANOJ
(Project Director)
Associate Professor & Head
Dept. of Physical Education, Kerala Agricultural University
Vellayani, Thiruvananthapuram - 695522

&

BIPIN. G.
(Member, Kerala State Sports Council)
Lecturer in Physical Education
KM College of Teacher Education,
Areacode, Malappuram

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CHAPTER-I

TOTAL PHYSICAL FITNESS PROGRAMME

Introduction

An active lifestyle during childhood directly benefits the health in both adulthood and old age. But due to the modern way of living and technological developments (e.g. cars, elevators, computers, television etc), both children and adults have become less physically active. In certain cultures, inactivity and the resultant obesity and diseases have reached 'crisis proportions'. Recent research revealed that Indians are more vulnerable genetically get to heart attacks than any other ethnic group in the world. One out of four Indian-Americans had high levels of Lp(a) when compared to the Japanese, Chinese, Caucasians and Hispanics. (Enas EA, 98). However, genes alone do not explain the sudden spurt in heart disease among the youth. The answer, in a word, is lifestyle. "Genetics load the gun, lifestyle pulls the trigger" is how Enas describes. (Dr Enas K. Enas, Director, CADI). WHO predicts that India will have 100 million about 60 per cent of the world's heart patients, by 2010 (India Today, June 11, 2001).

In our country 54 percent of our population is enjoying the prime of youth. But a black spot in this sunny picture is the increasing rate of heart diseases among the youth. Today, the average age in which a person may suffer a heart attack has come down from 40 years to 30 years. Obviously, this is mainly due to the changing lifestyles. In fact the rate of coronary heart disease in the Indian community - particularly in young men - is almost double when compared to western counterparts. "Modern lifestyle has proven to be the stimulus for the growth of heart diseases among the youth" says Dr Ashok Seth , Chief Invasive and Interventional Cardiology, Escorts Heart Institute. *"Improper food habits, lack of physical activity and this coupled with high level of stress and increase in smoking and alcohol consumption are all classic risk factors which can put one high on the risk zone of coronary heart diseases. Sadly all these have become a part of the Indian youth's lifestyle."* (http://health.indiatimes.com).

Incidence of heart diseases to increase by 2030

The productive life year loss due to deaths in the 35-64 age group in India was 9.2 million in 2000. This is likely to increase into 17.9 million by 2030, much ahead of China, Russia and USA, said the study carried out by the Earth Institute of Columbia University, USA. The study was instituted at the behest of renowned economist Dr. Jeffry Sachs who had headed the World Health Organisation (WHO) Commission on Macroeconomics and Health. Dr Sachs who was here last week expressed his concern over the possible loss of economic productivity. *He cautioned that about 35 per cent of all cardiovascular deaths in India would occur in the age group of 35-64 years during 2000-2030.* According to Dr K Srinath Reddy from the All India Institute of Medical Sciences "A national programme on the prevention of heart diseases with adequate policy support is essential to stem the menace, otherwise, our economic productivity is likely to go down,". (Deccan Herald, Monday, June 21, 2004, *Incidence of heart diseases to increase by 2030*, FROM KALYAN RAY DH NEWS SERVICE, NEW DELHI).

India predicts diabetes explosion

Experts say that the world's largest diabetes epidemic is threatening India, which is ill equipped to cope. Health data shows that, the amount of type II, or adult-onset diabetes in Indian cities is high, and rising. India has a population of more than a billion, and its citizens appear prone to developing diabetes in later life, and are certainly more vulnerable to its complications such as high blood pressure leading to coronary heart disease. *Part of the blame falls on the adoption of a more Western lifestyle, involving fatty food and too little exercise.* Dr Vikram Seshaiah, Medical Director of the Diabetes Unit, Apollo Hospitals, Chennai, while addressing the annual conference of the Association of Physicians of India told: "By 2005, we will have 30 to 35 million diabetics patients and every fifth diabetic in the world will be an Indian". Epidemiological data shows that now only the prevalence of type II diabetes is very high in the urban population, but it is also increasing. Another problem confronting the Indian health authorities is the relatively young age at which diabetes is being diagnosed in many patients. (http://news.bbc.co.uk/2/hi/health- India predicts diabetes explosion). It shows the declining level of exercise has the potential to increase the burden of chronic diseases in our population, directly as an independent risk factor and indirectly through increased obesity. Lifestyle choices have never been more important in determining the outcome of a national problem.

The need for development of Health Related Physical Fitness

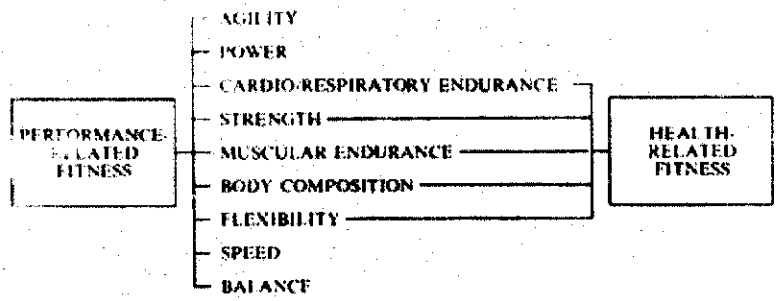
One of the most important goals of the Physical Education programme in schools and colleges is to develop physical fitness and to promote lifelong physical activity behaviours. To attain this goal the children must be introduced to the principles of regular physical exercise and recreational activities at an early age. Schools at all levels must develop and encourage positive attitudes towards physical exercise, providing ample opportunities to learn physical skills and perform physical activities, especially those that can be enjoyed for their lifetime.

The school curriculum should not overemphasize sports and other activities that selectively eliminate children who are less skilled. Besides, the benefits of exercise, the development and maintenance of a healthy lifestyle and a positive attitude towards exercise conditioning throughout life should be promoted in schools. Unfortunately we do not have a structured physical education programme. Majority of the school students are not exposed to any type of the physical education programme. Always, school authorities making the selection and imparting training only to those gifted students. We cannot blame completely the school authorities for such type of attitude because of paucity of manpower and infrastructure facilities. Lack of proper motivational techniques, failure to make awareness among the parents may also contribute to such phenomena.

Components of Health Related Physical Fitness

One of the major benefits of physical activity is that it helps people to improve their physical fitness. Fitness is a state of well-being that allows people to perform daily activities with vigour, thereby reducing health hazards. Five basic components of fitness are important for good health: **cardio respiratory endurance, muscular strength, muscular endurance, flexibility, and body composition (percentage of body fat).** The essential characteristic of health-related physical fitness is that exercise has a positive influence on these components, and that an adequate level of development in the above said components is necessary for positive health.

Table I: Components of fitness



Physical Fitness Status of School Children in Kerala

The physical fitness status of school children in Kerala was not known till 1995. The sample survey conducted in Trichur district shows that the physical fitness standards of the school children is very low and do significantly differ with their age and sex when compared to American Alliance Health Physical Education Recreation and Dance (AAHPERD) Health Related Physical Fitness Test (HRPFT) standards. Moreover, the abdominal strength/ endurance of high school girl student's show a decreasing trend when compared with lower classes (Manoj & Manoj, 1995). Poor performance on the tests sit and reach and sit-up indicates the possibility to develop lower back or other musculoskeletal problems in an individual due to inadequate flexibility and /or poor abdominal strength, (Ross& Pate, 1987) Sit-Up and Sit and Reach tests are clear indicators of abdominal strength and endurance. The abdominal muscles anteriorly have a very significant influence on the spine; hence good contracting of abdominal muscles gives added strength to the spine and helps to maintain posture. Lax abdominal muscles and potbelly not only create bad posture but also lay foundation for backache. Epidemiological studies in Kerala women shows that 60-70% of women aged more than 35 years have some problems related with a bad back.

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Health Related Physical Fitness Test (HRPFT) standards. Moreover, the abdominal strength/ endurance of high school girl student's show a decreasing trend when compared with lower classes. Poor performance on the tests sit and reach and sit-up indicates the possibility to develop lower back or other musculoskeletal problems in an individual due to inadequate flexibility and /or poor abdominal strength, Sit-Up and Sit and Reach tests are clear indicators of abdominal strength and endurance. The abdominal muscles anteriorly have a very significant influence on the spine; hence good contracting of abdominal muscles gives added strength to the spine and helps to maintain posture. Lax abdominal muscles and potbelly not only create bad posture but also lay foundation for backache. Epidemiological studies in Kerala women shows that 60-70% of women aged more than 35 years have some problems related with a bad back.

Since the concern for positive health extends to all ages, it is recommended that all persons be tested periodically on health related fitness components. Periodic testing places emphasis on the importance of an active lifestyle to maintain low amount of fat, high levels of cardio-respiratory function, achieve sufficient muscular strength, muscular endurance and flexibility in the lower trunk and posterior thigh areas for a healthy low back function (AAHPERD, 1980).

I. OBJECTIVES OF THE PROJECT

The proportion of children and adolescents between 9 to 17 years of age, who are regularly participating in appropriate physical activities, particularly cardio-respiratory fitness programmes, which can be carried into adulthood, should be greater than 90% (Currently less than 30%).

The proportion of children and adolescence of 9 to 17 years of age, participating in daily physical education programmes should be grater than 60%. (Currently less than 5%)

The methodology for scientifically and systematically assessing the health related physical fitness of children and adolescence should be established and 100% of children and adolescence between the age group of 9 to 19 years, participating in such testing programme for assessing health related physical fitness.

AVERAGE SCORE OF BOYS ON CHIEF MINISTERS FITNESS TEST AT THRISSUR (1999)

Test Item	Fitness Dimension Measures	Boys							
Age Group →		10	11	12	13	14	15	16	17
Sit-Up (nos in 60 sec)	Abdominal Strength/ Endurance	20.31 32.00 25.50	21.12 34.00 27.20	21.79 37.00 34.20	22.55 39.00 39.10	24.26 41.00 38.30	25.93 43.00 38.90	26.75 43.00 37.50	27.48 43.00* 38.80$
Sit & Reach (in cms)	Flexibility and low back musculoskeletal function	26.14 34.28 29.50	26.23 33.00 29.10	25.30 33.00 29.90	26.07 33.00 30.05	26.73 34.27 33.10	28.62 35.54 31.80	29.66 39.00 32.50	30.65 39.35* 32.10$
Modified Pull Ups (completed nos)	Upper body strength/ Endurance	9.04	10.78	10.33	10.67	11.28	11.01	10.20	10.42
1 Mile Run (min:sec)	Cardio-respiratory endurance	9:09 9:19 8:42	9:02 9:06 8:60	8:51 8:20 7:13	7:58 7:27 8:25	7:59 7:10 8:14	8:16 7:14 7:54	8:12 7:11 7:62	8:13 7:25* 7:30$
Body Mass Index (BMI)	Body Composition	13.66	13.69	14.34	14.68	15.78	16.46	16.99	17.10
Height (m)		1.31 1.28	1.35 1.33	1.40 1.38	1.45 1.44	1.55 1.50	1.60 1.56	1.62 1.60	1.64 1.61#
Weight (Kg)		23.64 23.50	24.95 25.90	28.37 28.50	31.24 32.10	37.54 35.70	42.17 39.60	44.68 43.20	45.84 45.70#

* US, $Japan #normal height and weight of Indian children (ICMR, 1971)

AVERAGE SCORE OF GIRLS ON CHIEF MINISTERS FITNESS TEST AT THRISSUR (1999)

Test Item	Fitness Dimension Measures	Girls							
Age Group →		10	11	12	13	14	15	16	17
Sit-Up (nos in 60 sec)	Abdominal Strength/ Endurance	17.42 31.00 22.60	16.62 32.00 26.40	15.97 33.00 26.80	15.96 33.00 27.60	16.51 35.00 28.70	16.54 35.00 33.80	14.29 36.00 27.70	14.06 36.00* 27.80$
Sit & Reach (in cms)	Flexibility and low back musculoskeletal function	25.57 36.81 32.90	27.06 39.80 31.30	27.41 39.35 34.30	27.67 40.62 36.60	29.05 43.16 35.40	30.05 43.18 37.50	30.69 44.43 36.40	28.84 45.70* 36.20$
Modified Pull Ups (completed nos)	Upper body strength/ Endurance	9.04	10.78	10.33	10.67	11.28	11.01	10.20	10.42
1 Mile Run (min:sec)	Cardio-respiratory endurance	10:32 11:06 9:17	9:55 10:27 9.07	9:46 9:47 9:48	9:29 9:27 9:55	9:48 9:35 10:24	10:34 10:05 9:52	10:46 10:45 9:47	11:26 9:48* 9:47$
Body Mass Index (BMI)	Body Composition	13.74	14.19	14.53	15.63	16.06	16.89	17.10	17.45
Height (m)		1.31 1.38	1.35 1.44	1.41 1.50	1.46 1.53	1.50 1.55	1.52 1.55	1.53 1.56	1.53 1.56#
Weight (Kg)		23.71 23.60	26.13 26.40	29.08 29.80	33.62 33.30	36.33 36.90	39.97 36.90	40.24 41.10	40.86 42.40#

* US, $Japan #normal height and weight of Indian children (ICMR, 1971)

Subordinate objectives:

1. Develop a scientific and systematic methodology to assess the health related physical fitness of school children.
2. Periodic revision of norms for assessing / comparing the performance with others within or outside the country.
3. Develop a motivational award system to gain peer and official recognition.
4. Customized computer software to provide the visual of fitness status.
5. Remedial programme for those who are performing below the recommended level.
6. Develop resources to help the students to gain knowledge, skills, appreciation and confidence to lead physically active and healthy lives.
7. Develop teachers guide and visual aids for instructors for provide guidance to students.
8. Develop practically feasible guidelines for establishing the fitness clubs in schools and colleges to guide motivate and monitor students' attitudes towards physical activity and help them to achieve the desirable standards on health related physical fitness.
9. To find out the physical activity habits of children and youth at school, home and in the community.
10. To monitor a broad range of priority health-risk behaviours among school and university students: behaviours that contribute to intentional injury, tobacco and alcohol use, unhealthy dietary behaviours, and physical inactivity.

II. SIGNIFICANCE OF THE PROJECT:

1. Precise and reliable measures of physical fitness are of great value to individuals, to educators and to policy-makers, who need them as an essential basis for working out any programme or chalking out any policy aimed at improving the individual or general levels of fitness.
2. Teaching of, and learning about, physical fitness can make an important contribution to each person's own self-knowledge and motivation to keep fit, and to the educative process generally;

3. Testing of physical fitness of children under controlled conditions, will provide important data to be used for the working out of State policies connected with children, health, nutrition, physical education and sports.

4. TPFP uses a simple and practical set of tests of health related physical fitness, suitable for widespread use among school-aged children, which is designed, inter alia, to realise the objectives set above, by providing knowledge of the condition of physical fitness among school-aged children of various age groups in the State.

5. Help to take appropriate steps in the light of the knowledge obtained from study in order to:

   a) Maintain or improve the basic standard of physical fitness amongst children, paying particular attention to those children or groups of children who are shown to have a low average level of physical fitness:

   b) Obtain data, which can be used for better co-ordination of policies concerning physical education, sport, health and health education:

   c) Alert others besides physical education teachers, including the children themselves, parents, schools, sports clubs, etc., about their several and mutual responsibilities in maintaining a reasonable standard of physical fitness among those committed to their charge;

6. The comparison of results with the other countries reference scales permits:

   i. a general overview of physical fitness amongst youth;

   ii. a pin-pointing of individuals or groups with health-related fitness deficiencies.

III. RELEVANCE TO THE PRESENT DAY PROBLEMS AND NEEDS OF THE SOCIETY AND THE COUNTRY

Two major contributors to chronic disease – sedentary lifestyle and excess weight - are becoming more prevalent day-by-day. Positive health habits formed in childhood frequently carry over to adulthood and may help to reduce illness from chronic disease and death. State has much interest

in developing policies that save the lives of our children from preventable chronic disease. The cost of harbouring India's 50 million heart patients is phenomenal – which is equivalent to $150 billion (Rs 6,90,000 crore). The cost of treating coronary heart disease (CHD) and other cardiovascular disease in adults comprises a significant portion of state health care outlay. The worst aspect of the disease, apart from the human cost, is that it strikes young people and affects their earnings. (Dr.Upendra Kaul, President, Cardiology Society of India) The government and agencies like the World Health organisation (WHO) are also awakening to the problem. "India bears the double burden of epidemics of communicable and non-communicable diseases" says Dr. Bob Kim-Farley, WHO's India representative. "On one hand, you have problems like tuberculosis, on the other, cancer and heart diseases." (India Today, June 11, 2001)

Priority health-risk behaviours that contribute to the leading causes of mortality, morbidity, and social problems among youth and adults are often established in youth, extended into adulthood, and interrelated. Colleges and universities are important settings for delivering health promotion education and services to many young adults.

IV. LIKELY CONTRIBUTION TO THE KNOWLEDGE

a. The results will provide a scientific basis to compare a student's performance with normative community standards; to determine the deficiencies in Health Related Physical Fitness.

b. The results will give an insight in to the risk behaviour of school and university students in the nation.

c. The results will provide precise and reliable data on Health Related Physical Fitness of school children and university students in Kerala, thereby helping the policy makers to formulate a suitable programme for improving their general levels of fitness.

d. The study will develop normative reference scales, which will help determine student's individual position in relation to community standards.

e. The reference scales will help to diagnose strength and weakness of the students, so that individual remedial work can be prescribed.

f. The reference scales can be used to place the students in classes or groups according to their physical ability in homogeneous groups, to facilitate quality instruction/ training.

g. Information gathered about different health-risk behaviour patterns viz; intentional injury, tobacco and alcohol use, unhealthy dietary habits behaviours and physical inactivity can be used nationwide by health and education officials to improve national, state, and local policies and programs designed to reduce risks associated with the leading causes of mortality and morbidity.

h. Results of the study will lead to designing physical education curriculam for all students in the schools/university that are a) enjoyable, b) build self-efficacy related to exercise performance, c) include significant amounts of physical activity and d) involve a cognitive component that address lifelong fitness activities and habits. Moreover, developing University reference scales, with reasonable and scientifically based standard set for determining minimum fitness levels that motivate students and will strive to attain.

V. REVIEW OF WORK ALREADY DONE

Few studies were conducted at national or state level in India regarding the physical fitness and physical activity habits of children and youth. Directorate of Sports and Youth Affairs, Government of Kerala, made a pioneering effort in this direction. A study, limited to Trichur district was conducted along with the implementation of the Chief Ministers Fitness Award: Kerala State Physical Fitness Testing programme.

The original AAHPERD (American Alliance for Health Physical Education Recreation and Dance) Youth Fitness test was published in 1958 and revised 1975 and 1976. The test was developed in response to a study that reported, European children scored higher on the Kraus-Webber tests of minimum muscular fitness than did American children scored (Kraus & Hirschland, 1954). In 1976, a national normative survey in US was completed and norms for the Youth Fitness Test (YFT) were revised (AAHPERD, 1976)

Youth fitness is on the decline, These data come from the results of the National Children and Youth Fitness Study (NCYFS) limited to 10 to 18 year olds of Americans, which was carried out to gather baseline data related to national objectives in physical fitness and exercise, The study compared the data collected in 1985 with previously collected data. With few exemptions for selected age groups, the children that comprised the 1985 sample were less aerobically fit and fatter than the earlier samples.

(Ross & Gilbert, 1985) A similar study (Morrow et al. 1984) with over 6,000 Texas school children produced similar results.

National Children and Youth Fitness Study (NCYFS II) has provided information never before available about physical fitness, physical activity patterns, and factors related to the physical fitness of children 5-9 of age (Ross & Pate, 1987). This information suggests that current programmes may be inadequate to promote lifetime physical fitness. Study findings challenge policy makers, researchers, teachers and members of the general community to make informed decisions about actions needed and to enhance the future fitness and physical activity habits of our children.

VI. KERALA STATE PHYSICAL FITNESS TEST BATTERY

After reviewing the various test batteries of similar nature in other countries, the Asia Youth Physical Fitness Test, proposed by Asia Regional Board of International Council for Health, Physical Education, Recreation, Sports and Dance (ICHPERD.SD) was selected. The criteria utilized for selecting the test were:

1. Tests are reasonably familiar.
2. Requires little or no equipment.
3. Can be administered to both sexes.
4. Will measures different components of health related physical fitness
5. Will allow self-testing by students.

KERALA STATE PHYSICAL FITNESS TEST BATTERY

Test Item	Fitness Dimension Measures
Sit-Ups (60 sec)	Abdominal strength / endurance
Sit & Reach (cms)	Flexibility and low-back musculo-skeletal function
Modified Pull-Up (completed numbers)	Upper body strength and endurance
1 Mile run (min: sec)	Cardio-respiratory endurance
Height (meters) and Weight (kg)	Body Mass Index (Body Composition)
Health Check-up	Examination of posture and nutritional status (By Medical Officer)

Norms for the selected test items for the age groups 9-17 for boys and girls were prepared in the year 1999 as part of "Chief Ministers" Fitness Awards. BMI was calculated as per WHO norms.

VII. HEALTH RELATED PHYSICL FITNESS TEST ITEMS

Detailed procedures for proper administration of each test items are detailed below. Blue prints of the score cards to be used at the time of student evaluation during the initial phase at schools are furnished in Appendices A and B.

ONE MILE RUN (1600 METRES)

Purpose: The purpose of the one-mile run is to measure maximal functional capacity and endurance of the cardio-respiratory system.

Test Description : Students are instructed to run one mile in the fastest possible pace. The students begin on signal, "ready, start". As they cross the finish line, elapsed time should be announced to the participants. Walking is permitted, but the objective is to cover the distance in the shortest possible time.

Equipment and Facilities : One mile run can be administered on a 400 metre or 200 metre track or on any other flat, measured area. Examples of appropriately measured areas are the 100 metre straightaway, other outside fields, or an indoor court area (See figure 1).

AREAS SUITABLE FOR DISTANCE RUN

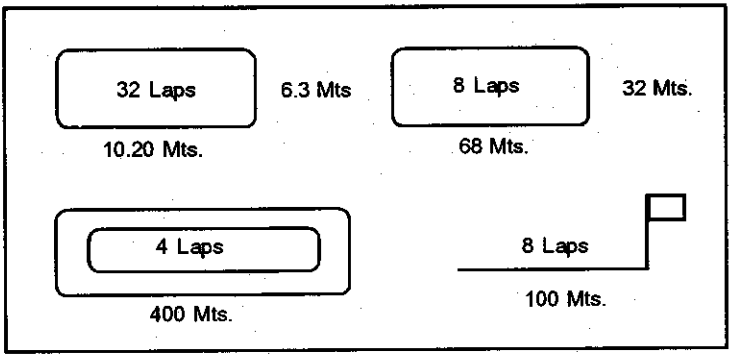


Figure 1 : Schematic drawing of areas which can be used for distance run tests.

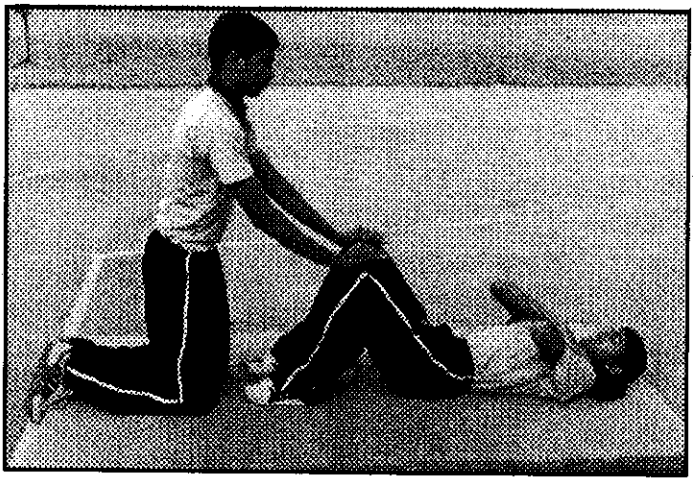
Scoring : The one-mile run is scored to the nearest of a second and the performance should be recorded on the individual score card (Appendix A).

Administrative Suggestions : In order to obtain valid and reliable results, students must be adequately prepared for the test. First, assurance should be obtained so that no children with known medical problems, which would contraindicate vigorous exercise, are allowed to take part in the test. Secondly, students should be allowed to practice distance running with emphasis placed on the concept of pace. Most uninstructed children will run too fast early in the test and then be forced to walk during the later stages. Results are usually better if the child can maintain a constance pace during most of the run, walking for short periods of time only if necessary, and perhaps using a strong closing effort. Thirdly, students should be properly motivated. Does the participant provide only as good as effort this test, like any other Physical Education tests. The purposeof the test should be fully explained to the students.

SIT-UPS IN 60 SECONDS (KNEES FLEXED)

Purpose : The purposeof the sit-up is to evaluate the abdominal muscular strength and endurance.

Starting Position of the Sit-up Test (Flexed Knees)



Executed Position of the Sit-up Test (Flexed Knees)

Test Description : To assure the starting position, the students lies on his/her back with knees flexed, feet on floor with the hands on the opposite shoulders. The feet areheld by partners to keep them in touch with the testing surface. The student, by tightening his/her abdominal muscles, curls to the sitting position. Arm contact with the chest mus be maintained. The chin should remain tucked on the chest. The sit-ups are completed when the elbows touch the thighs. To complete the sit-up the student returns to the down position until the midback makes contact with the teting surface (Figures 2a and 2b). When the timer gives the signal "ready go", the sit-up performance should be started and the performance should be stopped on the command "stop". The numberof correctly executed sit-ups performed in 60 seconds shall be the score.

Equipment and Facilities : Mats or other comfortable surfaces are recommended. Stop watch or sweep second hand from an electronic wrist watch may be used for timing.

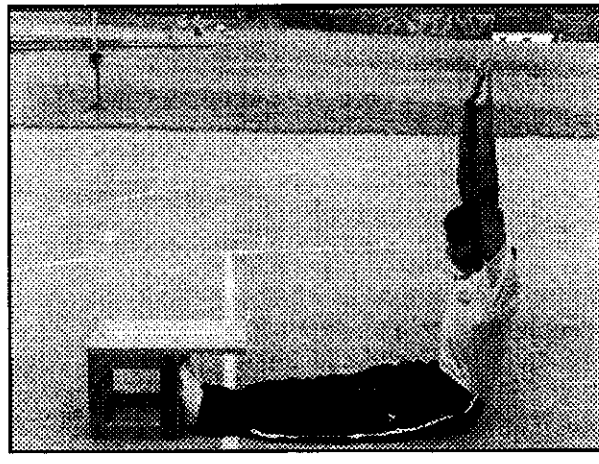
Scoring : Record thenumber of correctly executed sit-ups that are completed in sixty seconds.

Administrative Suggestions : It is important that the heels are placed at a proper distance (12 to 18 inches) from the buttocks. Teachers may want to use a measuring stick to ensure that the proper distance is maintained. Partners can be used to count and record each other's score, but the supervising tester must carefully observe to ensurethat the sit-ups arebeing

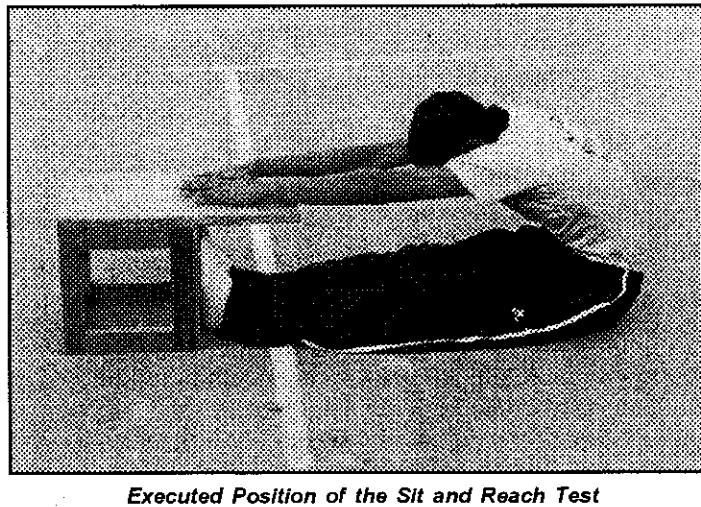
done correctly. Be certain that the student feet are in contact with the testing surface. This can be ensured by having the partner hold the feet or ankles.

SIT AND REACH TEST (SITTING POSITION)

Purpose : The purpose of the sit and reach is to evaluate the flexibility (extensibility) of the low back and posterior thighs.



Starting Position of the Sit and Reach Test



Executed Position of the Sit and Reach Test

Test Description : To assume the starting position, the students should be asked to remove their shoes and sit down at the test apparatus with their knees fully extended and the feet, shoulder width apart. The feet should be flat against the end board. The arms are extended forward with the hands placed on top of each other to perform the test. The pupil reaches directly forward, palms down, along the measuring scale four times and holds the position of maximum reach on the fourth trial. The position of maximum reach must be held for one second. The test apparatus and testing position are shown in figure 3a and 3b.

Equipment : The test apparatus consists of a specially constructed box with a measuring scale where 23 cm is at the level of the feet. Detailed drawings and instruction regarding construction of the box are provided in Appendix C.

Scoring : The score is the farthest distance point reached on the fourth trial measured to the nearest centimeter. The test administrator should remain close to the scale and note the farthest distant point touched by the fingertips of both hands. If the fingertips reach unevenly, the test should be re-administered. The tester should place one hand on the subject's knees to ensure that they remain extended.

Administrative Suggestions : Proper warm-up is very important for this test. The warm-up should include slow sustained static stretching of the low back and posterior thighs. The test trial is repeated if :

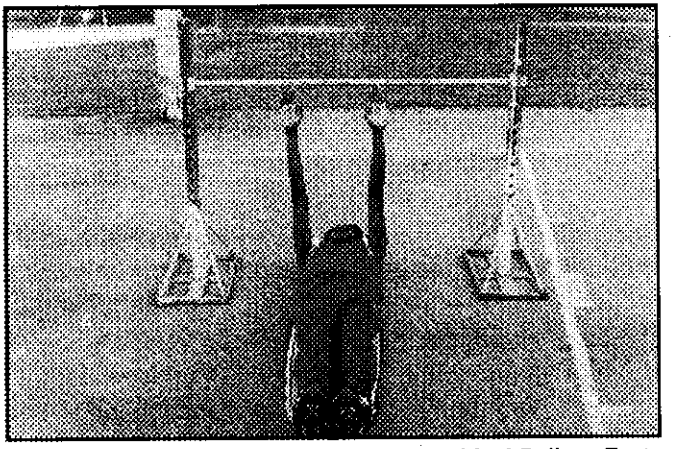
(1) The hands reach out unevenly or (2) The knees are flexed during the trial. At the time of doing the test a partner placing his/her hands lightly acoss knees can prevent the flexing of knees. Besides, inorder to prevent the test apparatus from sliding away from the student during the test, it should be placed against a wall or a similar immovable project.

MODIFIED PULL-UPS

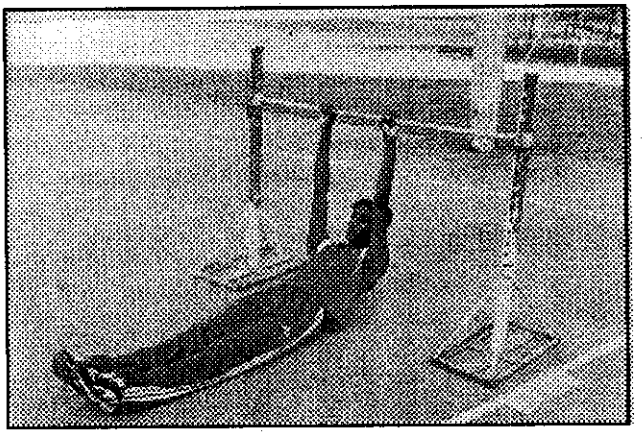
Purpose : The purposeof the Modified pull-ups test is to test the should strengthal endurance.

Test Description : The horizontal bar should be positioned at a particular height, which is just reachable to a student, who lies on his/her back on a flat surface. Then the studen should be asked to clasp the horizontal bar with over grasp. When the student is ready, the test leader should give the signal "Go". On hearing the signal "go", the subject should start to raise the body by flexing the arm until the chin is pulled up to the level of the

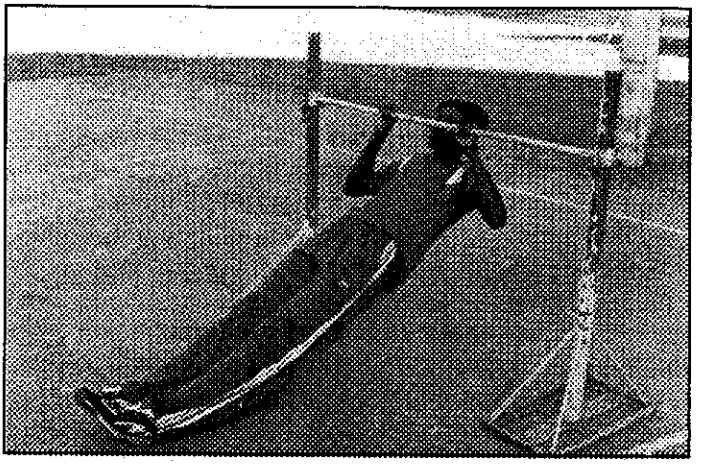
horizontal bar. Then the student should lower back to the starting position with shoulders touching the ground, this procedure should be repeated as many times as possible. The test will stop when the student pauses for two or more seconds. The testers should ensure that the subject keeps the knees straight during the test. Execution of the test is shown in Figure 4a and 4b.



Adjusting the height of the Cross Bar for modified Pull-up Test



Starting position of the modified Pull-up Test



Executed position of the modified Pull-up Test

Equipment : The test appartatus consists of a specially constructed horizontal bar that can be positioned at a height that allows the student to clasps the bar with over grasp when lying on theback on a flat surface. The detailed drawings regarding the construction of the equipments is shown in Appendix D.

Scoring : The student's scoreis the number of correctly executed pulls-ups.

Administrative Suggestions : The core groups should make improvisation of equipment for the sage and proper conduct of the test. Mats can be used more comfortable execution of the test.

VIII REMEDIAL PROGRAMME

All the students not qualified for the minimum fitness grade need to undergo a remedial programme. The programme will suggest individualised exercise prescription for each student considering the deficient in criterion fitness measures in consultation with the Medical Officer. A hand book for inculcate physical activity as a lifetime behaviour will be prepared with details of suitable type of activities and necessary directions for motivating the students to attain minimum fitness award next time. The concerned physical education teachers will be provided sufficient training and materials for assisting the students.

IX. FOLLOW-UP PROGRAMME- TALENT IDENTIFICATION AND DEVELOPMENT

A follow-up programme for talent identification and development also an indispensable part of this mega event. Necessary directions and feedback will be given to the physical education teachers of the concerned schools to impart training and special care to student recipients of higher grades. The physical education teachers can able to help them to find out suitable sports discipline. A special camp for those grade recipients will be conducted in each Panchayath / Municipality / Corporation level with help of Kerala State Sports Council during summer vacation. Another camp under the direct supervision of KSSC will conducted for recipients of Grade A. Activity Guide: Secondary Level and Teachers Guide: Physical Education for Lifelong Fitness also will be prepared as part of the programme to provide the resources for teachers.

X. PLAN AND MANAGEMENT DETAILS THE TESTING PROGRAMME

The state physical fitness testing programme is planning to implement through the three-tier system of local self government with help of education, health and sports departments. The programme aim to assess the health related physical fitness of 100% school going children which includes state schools, CBSE, ICSE, KV and Navodaya Vidyalayas. The Chairman's of the local level administrative committees should initiate the action to bring the other streams to under go the programme by brings them into the consensus. The different level committees as mentioned below were suggested to implement the programme.

TPFP - State Technical Council		
District Technical Councils (14 nos)		
Panchayath Committees (999)	**Municipalities (55)**	**Corporations (5)**
School Level Core Core Groups	**School level Core Groups**	**School Level Core Groups**

RESPONSIBILITIES OF PANCHAYATH TECHNICAL COUNCIL

The important responsibility of the committee is to take the necessary arrangements for conducting of the testing programme and ensuring the reliability. The committee should actively involve in constitution of the core groups in school level, development of equipment, conduct of testing programme, compile and reporting of the results using the software, make arrangement for printing of health & fitness card, minimum fitness awards and follow-up and remedial programme.

RESPONSIBILITIES OF CORPORATION/ MUNICIPAL TECHNICAL COUNCIL

The important responsibility of the committee is to take the necessary arrangements for conducting of the testing programme, ensuring the reliability. The committee should actively involve in constitution of the core groups in school level, development of equipment, conduct of testing programme, compile and reporting of the results using the software, make arrangement for printing of health & fitness card, minimum fitness awards and follow-up re-remedial programme.

XI. TRAINING PROGRAMME FOR DISTRICT CO-ORDINATORS AND SCHOOL LEVEL CORE GROUPS

A five member group of district co-ordinators lead by Chief Co-ordinator will be identified and trained in each district; they will impart training to the school level core group teachers in each block level/ municipality/ corporation in convenient phased manner. An educational video also produced to provide technical assistance to the core group members and it will act as the ready reference at any point of the testing programme. The training programme for group of district co-ordinators will be conducted as two day programme with hands-on training in testing programme, recording the results, extracting the reports and reporting the results. The training for school level core group teachers will be conducted in block Panchayath level, municipality and corporation level as a single day workshop by the district co-ordinators. The awareness about the correct testing protocol is very much essential for them to prepare the students for testing. The training programme should include: familiarisation with study protocol and development of technical skills, mechanism for medical

exclusions, description of the nature of the test items and proper dress code, supervised application of skill acquired, general review, procedure for recording and reporting the result, discussion of doubts and common problems.

XII. GRADE SYSTEM

A Grade system is developed to give recognition to boys and girls, who have demonstrated by performance that they have attained certain levels of Health Related Physical Fitness. The standards for the four Grade levels are based on the norms developed in accordance with the standard of the students in Kerala State. The grades will be in the form of badges to be worn on shirts and certificates.

GRADE-D

Certificates of merit will be given to those children who attain the standards of 50th percentile in their respective age and sex on the entire four test items separately.

GRADE - C

Total Physical Fitness Grading will be given to those children who attain the standards of 75th percentile in their respective age and sex on all the four test items separately and the BMI should be below 24, during the second stage of the testing programme, being organized under the direct supervision of the State Testing Authority on block panchayath, municipality and corporation basis. The grade include a certificate of merit and a badge to be worn on shirts.

GRADE - B

This is being given to those children, who attain the 85th percentile in all the four test items separately and BMI should be below 24, at the second stage of the testing programme being organized under the direct supervision of the state testing Authority on block panchayath, municipality and corporation basis. The grade include a certificate of merit and a badge to be worn on shirts.

GRADE - A

This is the highest grade given to a child and denotes an exceptional level of achievement on all four-test items of the health related physical fitness test battery separately and BMI should be below 24, besides a distinction in other type of physical activities. To be eligible for this grade, a child must attain the standards of 90th percentile on all the four test items separately during the second stage of the testing programme, since there will be many contenders for this award in a particular age group of a sex, in addition to the contender's performance in the four test items, his/ her proven record in other sports items and recreational activities involving physical activities will also be taken into consideration for the grade. This grade include a badge to be worn on shirts, certificate of merit and a cash award of Rs.500/- each. (A third stage of the testing programme, being organized under the direct supervision of the State Testing Authority on in Revenue District level)

FITTEST SCHOOL AWARD

A cash award of Rs.10,000/- and a memento will be given to one school each in boys and girls section separately irrespective of the age groups in each district. The schools with the highest percentage of students who score more than the 75th percentile in all the four test items separately during the second stage of the testing programme, in accordance to the total enrolled strength of that particular school (For this purpose the roll strength of a pupil on the 6th working day of a school will be considered) will be taken into consideration for awarding the Fittest School Award.

FITTEST PANCHAYATH / MUNICIPALITY / CORPORATION AWARD

A cash award of Rs.10,000/- and a memento will be given to one Panchayath in each district, one municipality and one corporation at state level by calculating the total points scored by boys and girls in their locality in relation with total number of students participated.

TABLE OF STANDARDS BOYS

TABLE I **GRADE - D**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	9:12	9:03	8:35	8:04	7:51	7:30	7:21	7:31
Modified Pull ups (nos. completed)	12	11	13	14	15	15	16	16
Sit and Reach (cms)	25	25	26	26	27	29	30	31
Sit ups (nos. completed)	28	30	32	32	35	36	38	37

TABLE II **GRADE - C**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	8:13	8:06	8:00	7:10	7:12	7:18	7:08	7:20
Modified Pull ups (nos. completed)	14	15	16	18	18	18	19	20
Sit and Reach (cms)	30	28	28	30	31	32	34	35
Sit ups (nos. completed)	34	36	38	40	41	42	43	43

TABLE III **GRADE -B**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	8:10	7:25	7:15	6:49	6:49	6:50	6:39	6:40
Modified Pull ups (nos. completed)	16	18	19	22	22	22	24	24
Sit and Reach (cms)	32	31	31	32	33	35	36	38
Sit ups (nos. completed)	37	38	41	42	43	44	45	45

TABLE IV **GRADE - A**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	7:30	7:12	7:00	6:13	6:10	6:00	6:00	6:08
Modified Pull ups (nos. completed)	18	20	23	26	27	25	27	28
Sit and Reach (cms)	34	33	33	34	35	37	39	40
Sit ups (nos. completed)	40	41	44	46	47	48	49	50

TABLE OF STANDARDS GIRLS

TABLE V **GRADE - D**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	11:14	11:00	10:48	10:30	10:42	10:15	10:21	10:21
Modified Pull ups (nos. completed)	6	7	8	9	9	9	8	8
Sit and Reach (cms)	26	27	28	29	30	30	32	30
Sit ups (nos. completed)	20	22	23	22	23	23	23	23

TABLE VI **GRADE - C**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	10:09	9:56	9:52	8:54	8:34	9:00	9:06	9:00
Modified Pull ups (nos. completed)	9	11	11	12	13	14	14	15
Sit and Reach (cms)	28	29	30	30	30	34	35	35
Sit ups (nos. completed)	28	28	24	26	26	26	27	27

TABLE VII **GRADE - B**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	9:50	9:52	8:34	8:32	8:11	8:26	8:24	8:25
Modified Pull ups (nos. completed)	13	16	16	18	18	19	18	19
Sit and Reach (cms)	30	31	32	33	30	36	36	38
Sit ups (nos. completed)	31	31	32	28	28	28	29	29

TABLE VIII **GRADE - A**

	Age in years							
	10	11	12	13	14	15	16	17
One Mile run (min: sec)	9:90	8:32	8:04	8:27	8:00	8:23	8:14	8:13
Modified Pull ups (nos. completed)	16	19	19	23	23	24	21	22
Sit and Reach (cms)	32	33	34	35	35	39	38	40
Sit ups (nos. completed)	37	37	40	37	37	38	38	38

CHAPTER - II

BASIC EXERCISE SCIENCE

Physiology of Fitness
Functional Anatomy and Biomechanics

The purpose of this chapter is to provide the scientific information on which we have based most of our fitness recommendations. The chapter is divided into our two major sections: physiology of fitness and anatomy and biomechanics. In the first section, we will discuss the energy for muscle contraction, how the cardiorespiratory system responds to exercise, and how men and women differ in their responses to the same exercise. In the second section, we will present information on anatomy as it relates to physical activity. Though some people may find this information overwhelming, we hope that we can tie some things together.

Physiology Related to fitness Relationship of Energy to work

The body needs energy to do work, any kind of work. There are different kinds of energy in the body.

- *Electrical energy* is involved in the transmission of impulses in nerves and muscles.
- *Chemical energy* is stored during the synthesis of large molecules from smaller molecules, for example, proteins from amino acids.
- *Mechanical energy* is the result of a muscle causing a bone to move.
- Thermal (heat) energy is derived from all these processes to keep the body warm.

Where do we obtain the energy for all these processes? The sun is the ultimate source pf this energy; plants capture the sun's energy and use it to convert carbon, oxygen, hydrogen, and nitrogen into carbohydrates, fats, and proteins. It is this food energy that provides all the energy the body uses to breathe, think, and run. Energy is contained in the chemical bonds of carbohydrates, fats, and protein, but for that energy used to be used by the nerves, muscles, and other cells, it must first be converted into adenosine triphosphate (ATP), because that is the only form of energy that cells use. It is important to remember that ATP must be delivered to a

cell as fast as it is used for the cell slows down or dies. ATP must be delivered to muscles at extremely high rates when a person runs a short distance and for hours on end as in a 26-mi, 385-yd marathon. To simplify our discussion of how this is done, we have divided the energy supply to the muscle into three categories based on how fast and how long it can continue to delivered ATP to the muscles.

Immediate sources of Energy

Our muscles have a very small store of ATP that would last about 1 s during intensive excessive. In addition, we have another high energy compound called creatine phosphate (CP) that can replace ATP almost instantaneously. However, CP lasts only about 3 to 5 s during intensive activity. As you can see, these immediate sources provide quick energy when we need it but do not last long. Oxygen is not required for this, so we classify these anaerobic (without oxygen) sources of energy.

Short-Term Sources of ATP

As our immediate sources of ATP are running out, we can obtain additional ATP at a rapid rate through the breakdown of muscle glycogen (the glucose store in muscle). This process is also anaerobic and can supply ATP for strenuous activities lasting less than 2 min. The by-product of the anaerobic breakdown of glucose is lactic acid, which may interfere with this energy producing processes well as with the actual means by which a muscle contracts. Though this obviously presents problems, this anaerobic source of ATP allows us to run at a high rate of speed when we must. A global in fitness programs is to minimize the use of this process because it contributes to fatigue.

Long-Term Sources of Energy

Most of the ATP used by the body is derived from using fats and carbohydrates in the presence of oxygen. This is sometimes referred to as aerobic (with oxygen) energy production, in contrast to anaerobic energy production. On the one hand, this aerobic process does not produce ATP at as fast as the anaerobic process, taking as long as 3 min or so to meet the ATP demand of the muscle. On the other hand, the aerobic processes can supply ATP on a "pay-as-you-go" basis, allowing activity to continue for long periods of time. The oxygen needed for this process is delivered by the blood that is pumped to the muscles by the heart. This is the crucial link between the type of energy production at the muscle and the

cardiovascular training effect that occurs in fitness programs. Thus, the emphasis in fitness programs should be pm aerobic energy-producing processes in the muscle, which, in turn, stimulate the heart to deliver the necessary blood. But which of these anaerobic or aerobic energy-Producing processes is most important in physical activity?

The answer depends on the type of physical activity. In maximal activities lasting less than a minute the anaerobic (immediate and short-term) sources of ATP supply most of the energy. In all-out activities lasting 10 min, the contribution of ATP from anaerobic energy processes accounts for only 15% of the total.

Part of the reason for this variation in the use of aerobic and anaerobic energy production processes is found in the type of muscle fiber used in the activity. In very intensive, high-speed activities we use fast twitch muscle fibers, which produce ATP primarily through anaerobic processes, resulting in the production of lactic acid. Slow twitch muscle fibers produce only small amounts of tension but are extremely resistant to fatigue due to the fact that most of their energy comes from aerobic processes. These slow twitch muscle fibers have more capillaries to carry oxygen to the muscle and more mitochondria to produce ATP with oxygen. With endurance training both fast and slow twitch muscle fibers improve their capacity to produce energy by aerobic means due to an increase in capillaries and mitochondria. This results in less lactic acid production and accumulation and therefore a greater resistance to fatigue.

Metabolic, Cardiovascular, and Respiratory Responses to Exercise

Fitness activities are used to provide an adequate stimulus to the cardio respiratory system to improve or maintain function and to expend calories. This section presents basic information on how energy production and the cardio respiratory system respond to both sub maximal exercise and a graded exercise test taken to the subject's limits.

Sub maximal "Steady-State" Exercise

The oxygen used for ATP production comes from the blood that is delivered to the muscles by the cardiovascular system. The respiratory system (lungs and respiratory muscles) moves the oxygen from the atmosphere to the blood. It is the coordinated activity of these two systems that results in the correct amount of oxygen reaching the muscles allowing us to continue our workout over a period of 30 t 40 min. As oxygen delivery

to the muscles cannot increase instantaneously in the first seconds of exercise, how do we meet the energy requirement during this time?

Let's consider, for example, an individual standing at rest alongside a treadmill with its belt running at 6 mph. On command, the person jumps onto the belt. The display shows the oxygen uptake over the course of the 5-min run that is followed by a 3-min recovery. The symbols on the graph show that the oxygen uptake is at each minute. While the person stands alongside the treadmill, the resting oxygen uptake is at each minute. While the person stands alongside the treadmill, the resting oxygen uptake value is .25 L.min -1, but this value increases rapidly during the first minute and more slowly over the next 2 min. By the third minute the oxygen uptake meets the steady-state oxygen requirement needed to continue the exercise, with virtually all the ATP produced by aerobic. As the oxygen uptake does not increase immediately during the first seconds of exercise, the body is said to incur an oxygen deficit during this period. During the oxygen deficit the immediate and short-term sources of ATP provide the ATP that the aerobic processes cannot. This is a good example of how the three energy sources of ATP (immediate, short-term and long-term) work together to allow us to gradually make the transition from rest to exercise and continue the activity for 30 to 40 min. If we did not have these anaerobic sources of ATP at the start of the treadmill run, we would not be able to meet the ATP requirement and would have drifted off the back of the treadmill. When the run is completed, the person jumps off and stands alongside the treadmill. Oxygen uptake does not immediately return to the resting level; this "extra" oxygen consumed over and above the resting level is called the oxygen debt or excess post exercise oxygen consumption (EPOC). The body uses some of the additional oxygen to make the ATP needed to restore the creatine phosphate (immediate source of ATP) store back to normal. Meanwhile, the body uses about 20% of the "extra" oxygen to convert some of the lactic acid back to glucose in the liver. The remainder is used to support the activities of the various systems that do not immediately recover at the cessation of exercise- like heart rate and breathing.

If a person can reach the steady-state oxygen requirement sooner after the initiation of exercise, a smaller oxygen deficit is incurred and the person depletes less CP and produces less lactic acid because the body relies less on the anaerobic sources of energy. Participation in a fitness program cause changes in the capillaries and mitochondria of muscles as well as the cardiovascular system so that oxygen uptake increases to the

steady state more rapidly at the onset of exercise. People with low levels of cardio respiratory fitness take longer to reach the steady state, producing more ATP from anaerobic processes with a higher lactic acid level the result.

This link between cardio respiratory fitness and the ability to use oxygen should be no surprise given the purposes of these systems. Neither HR nor exercise; both follow a pattern v very similar to the oxygen uptake curve. This gradual increase in both helps to explain the "lag" in oxygen uptake at the onset of work. Another part of the lag is explained by the mitochondria, which cannot instantaneously increase their ATP- generating ability. The more mitochondria you have, how-ever, the faster the oxygen uptake can increase at the onset of work. That is the mark of an endurance-trained person.

Graded exercise test. Given that our ability to do sustained exercise depends on the cardiovascular systems ability to deliver oxygen to the work in muscles, it should be no surprise that we use exercise tests do determine cardio respiratory function. In a graded exercise test (GXT, the subject completes a series of progressively more difficult exercise tasks until a defined end point, such as 85 % of maximum HR or voluntary exhaustion, is reached. The GXT can be done on a treadmill with the walking speed constant and the grade increasing 3% each 3min, or a cycle ergometeter (a stationary cycle on which the work load can be set) on which the pedaling resistance increases at 3-min intervals. During each stage (3- min work period) of the GXT, a wide variety of physiological measures can be monitored: heart rate (HR), blood pressure (BP), electrocardiogram (ECG), oxygen uptake, ventilation, and blood lactic acid. Each of these measures provides an indication of how well a person is adjusting to the exercise, which is related to the subject's present level of fitness.

Oxygen Uptake and Maximal Aerobic Power. Oxygen uptake can be measured at each stage of the GXT. Normally, oxygen uptake is expressed in milliliters of oxygen per kilogram per minute (ml.kg.-1.min-1) instead of L.min-1. This allows comparison of people with different body weights. Oxygen uptake increases in a regular pattern with each stage of the test and levels off as the oxygen requirement is met. This pattern continues until the body reaches its cardio respiratory system limits. At that point, oxygen uptake does not increase when the grade of the treadmill

is increased. The point at which oxygen uptake levels off is called the subject's maximal aerobic power. This term describes the following.

1. The maximal rate at which the cardio respiratory system can deliver oxygen to their working muscles. In this way, maximal oxygen uptake (or maximal aerobic power) is a measure of cardio respiratory fitness.
2. The maximal rate at which ATP can be produced aerobically. This indicates how well someone can perform in long-distance runs, swims and cycle competitions.

An untrained person participating in an endurance training program can increase maximal aerobic power about 5% to 25%; the less fit the individual, the larger the gains. Steady-state oxygen uptake reached at each stage is about the same, but the person achieves the steady-state value a little sooner following training. At the end of the test oxygen uptake increases when the treadmill grade is raised to 18% , indicating that the person's cardiovascular system can now deliver more blood to the working muscles than before training, when the leveling-off point was at the 15% grade. In spite of the increase in maximal aerobic power an individual can achieve through training, the average person is not likely to become a world-class endurance athlete. The link of maximal aerobic power to endurance performance is seen in the classes of athletes with the highest values-cross- country skiers and distance runners. Women's values are about 15% lower than those of men, independent of the group, and, not surprisingly, people with cardiovascular or respiratory disease have the lowest values. Maximal aerobic power decreases with age (about 1% year) in the average population; the decrease is related to the fact that we tend to become more sedentary and heavy as we grow older. Both of these factors, independent of age, decrease maximal aerobic power. Some recent evidence suggests that in those who stay active and do not put on weight, maximal aerobic power decreases only half past. This certainly is another good reason to stay active, because a fit person has greater freedom to choose recreational activities later in life. Let's look, now, at what happens to some of the other measures during a GXT.

Blood Lactic Acid: The changes in blood lactic acid during the GXT mentioned earlier. The lactic acid level begins to increase of the person's maximal oxygen uptake. This indicates that the working muscles are now producing the lactic acid faster than other tissues (liver, heart, and other muscles) can use it. This sudden increase in lactic acid concentration has

been called the anaerobic threshold or the lactate threshold (LT). With training, an individual can work at higher intensities of exercise before the lactic acid level begins to increase. This is due primarily to the increase in the capillaries and mitochondria of the trained muscles, which allows the body to produce more ATP aerobically.

Heart Rate:. At very low work rates, HR doesn't change much when the treadmill grade is increased/ however, when HR reaches about 110 beats.min-1 it increases in a regular manner with increases in the grade of the treadmill. In this way, HR is a good indicator of how much oxygen an individual is using. This linear increase in HR is the basis for all sub maximal GXTs used to predict the subject's maximal oxygen uptake. In these sub maximal tests, you can measure the subject's HR at several sub maximal work rates, draw a line through those points, and extend it to the subject's estimated maximal HR. You then can estimate the subject's maximal aerobic power from the grade of the treadmill that would have been achieved if the subject had been achieved if the subject had been allowed to work until maximal HR was reached. Thus, you can estimate maximal aerobic power with the subject doing only sub maximal work. Because of this linear relationship between HR and oxygen consumption, HR is the best predictor of exercise intensity and is a very sensitive indicator of the training state. The subject accomplishes each submaximal stage of the GXT with a lower HR, indicating an improvement in the cardiovascular response to exercise. Two important points to remember are the following:

1. The subject's maximal HR either does not change or decreases slightly with training.
2. If you are using the 220 – age formula for estimating maximal HR, remember that the error in estimation can be considerable. A 30-year-old could have a maximal HR of 160 to 220 beats.min-1 instead of 190 beats.min-1 (68%of30-years-olds measure between about 180 and 200 beats.min-1).

Stroke Volume and Cardiac Output: The volume of blood pumped from the heart per beat is called the stroke volume. The product of heart rate and stroke volume determined the volume of blood pumped to the tissues per minute; this is called the cardiac output. For exercise in the upright position (e.g.,, cycling, walking), stroke volume increases slightly during the first few minutes of a GXT until a work rate of about 40% of maximal oxygen uptake is reached; stroke volume then levels off. This means that beyond 40.5 OF MAXIMAL OXYGEN UPTAKE, HEART RATE

IS THE ONLY FACTOR CAUSING THE CARDIAC OUTPUT TO INCREASE. It is this fact that makes HR such a good indicator of how hard the heart is working and how close it is to its maximum limits. With training, stroke volume increases, allowing the cardiac output to be higher than before in spite of no change in maximal heart rate. In this way, the primary cardiovascular variable causing the increase in maximal stroke Volume.

Oxygen Extraction: The amount of oxygen taken up by the body depends on two factors: the volume of blood circulated to the tissues per minute (cardiac output) and the volume of oxygen extracted from the arterial blood during one pass around the circuitry system (oxygen extraction). Oxygen extraction is expressed as the number of milliliters of oxygen taken from one liter of blood (ml O2.L-1).

As the work rate increases, the number of muscles involved also increases. This brings more and more blood into the capillaries where the oxygen can be given up to mitochondria, which use it to produce ATP. With an endurance training program, the ability to extract oxygen increases, explaining about 50% of the increase in maximal aerobic power that occurs with training.

Tremendous variability that exists in maximal aerobic power among different groups, some groups having level twice as high as others have. What causes such variability? For the most part the variability can be explained by variations in maximal cardiac outputs among the different groups, because maximal oxygen extraction is only slightly higher in trained subjects. Highly trained subjects may have cardiac outputs more than 50% higher than those of their sedentary counterparts. But is maximal cardiac output in the trained person due to a higher maximal HR or a higher stroke volume? The following examples will answer this question.

Maximal Cardiac Output = Maximal Heart Rate
X Maximal Stroke Volume
Trained athlete: 30 L.min-1=190beats.min-1 X.16 L.beat-1
Untrained person: 20L.min-1=200 beats.min-1 X .10 L.beat-1

As you can see, the higher maximal cardiac output in the trained athlete is due exclusively to the higher stroke volume. This higher stroke volume is due to both genetic factors as well as the training effect that causes the ventricle of the heart to be larger. This is a functional enlargement of the heart, because the heart has a greater capacity to pump oxygen-rich blood to the muscles.

Blood Pressure: The systolic pressure increases in a regular manner with increasing exercise intensity, and the diastolic pressure remains about the same or decreases slightly. If during a GXT the systolic pressure fails to increase or the diastolic pressure increases when the grade is increased, this indicates that the subject is approaching the limits of the cardiovascular system. An endurance training program tends to lower the blood pressure of those who were borderline hypertensive prior to the program.

When HR and BP are elevated during exercise, the heart is working hard and is consuming oxygen at a high rate. A measure of the work of the heart is the double product, which is the product of the HR response to a work task is lower, indicating that the work of the heart is decreased (HR x systolic BP). This is important, especially for those with a compromised coronary artery circulation that must supply blood to the heart. If the oxygen demand of the heart is less because of the lower HR, the arteries are more likely to be able to meet the demand.

Pulmonary Ventilation: The volume of air breathed per minute is called the pulmonary ventilation. The ventilation increases in a linear manner until about 60% of the person's maximal work rate is reached and then rises more quickly. This sudden increase in ventilation (a slight hyperventilation) is called the ventilatory threshold is shifted to the right.

Summary of the Effects of Endurance Training and Detraining: A wide variety of physiological (HR), structural (mitochondria), and biochemical (enzyme) changes occur as a result of participation in endurance exercise.: The number of Mitochondria and capillaries increase in all active muscle fibers. This result in an increased ability to transport oxygen from the blood to the muscle and an increased capacity of the muscle to use oxygen for energy production.

The time it takes to get to the steady state in submaximal work is decreased. This reduces the oxygen deficit and the production and accumulation of lactic acid in the muscle and blood. The size (diameter) of the ventricle of the heart is increased, allowing more blood to be pumped with each beat of the heart (stroke volume). This result in the "classic" training effect seen when an individual can do the same work rate after training at a lower heart rate (and perception of effort).

Cardio respiratory fitness (VO2max) is increased as a result of the increased stroke volume (able to pump more blood to the muscles during

maximal work) and the increased number of capillaries and mitochondria in the trained muscles (able to extract more oxygen from the blood)

An individual can maintain these training effects as long as she continues to participate in endurance exercise. If she stops training, the adaptations listed. If she stops training, the adaptations listed return toward their pertaining values. If, however, the person choose to simply reduce the duration or frequency of training (by 1\3or2\3), VO2max is not affected very much. In contrast, when the intensity of the workout is reduced by 1/3or2/3, VO2max is decreased. The data suggest that it is easier to maintain a training effect if exercise intensity is maintained at a high level. This, however, can cause problems for the occasional exerciser (see chapter 18 on injury prevention).

Cardiovascular Responses to Exercise for Males and Females: Earliest in this chapter we mentioned that maximal aerobic power is about 15% lower for females than for males. This is true for all ages after puberty and for all levels of physical ability. Why? The answer is found primarily in three factors: heart size relatively to body size, body fat, and hemoglobin levels in the blood.

Heart size: At adolescence, females develop a smaller heart size relative to their increase in body size. As a result, they cannot transport as much blood during maximal exercise compared to a male of the size. This limits oxygen delivery and consequently, oxygen uptake at the tissues.

Body fat: At puberty, the female increased body fat percentage more than the male, which results in about 10% higher essential fat for females. Given the fact that maximal aerobic power is expressed in units relative to body weight (you must divide body weight into the measured oxygen uptake), the value for females will be lower than that of males, everything else being equal. We mentioned this effect of added fat earlier in our explanation of why maximal aerobic power decreases with age.

Hemoglobin: Oxygen transported in the blood bound to hemoglobin, which is founding the red blood cells. The female has about 130 g of hemoglobin in a liter of blood, compared to 150 g for the male. Thus, the male can transport more oxygen per liter of blood.

Submaximal Exercise: These factors also affect how a woman responds to submaximal exercise compared to her male counterpart. When a male and female exercise. These three factors also affect how a woman responds to submaximal exercise compared to her male counterpart. When

a male and female exercise at the same work rate on a cycle ergo meter, each has to transport the same amount of oxygen to tissues. As a result of the difference between males and females listed above, there will have to be higher physiological responses for the female compared to the male for the following reasons.

1. Due to the lower stroke volume (related to a smaller heart size), the female's heart rate has to be higher to compensate.

2. Due to the lower hemoglobin level, the female's cardiac output has to be slightly higher during submaximal work to deliver the same amount of oxygen to the tissues (as there is less oxygen per liter of blood). This increase in cardiac output is brought about by a higher HR

3. The difference in body fatness between the sexes also causes a difference in the physiological responses to exercise when body weight is being carried along, as in walking or running. In these activities, the amount of oxygen used in the activity is proportional to body weight. If a male runs at 6 mph, approximately 35 ml of oxygen is required per kilogram of body weight oer minute (35ml.kg-1min-1) to maintain that speed. If we now add 10 kg to that person's back, the oxygen requirement is still the same per kilogram of weight (35ml), but the total amount of oxygen required to continue the activity with the higher weight is 350 ml more per minute (10kg x 35ml.kg-1min-1). The average female carries relatively more fat than the male; this extra weight requires additional oxygen to carry it along, necessitating a higher HR to deliver that additional oxygen to the muscles.

Cardiovascular Responses to Isometric (Static) Exercise: We have primarily dealt with the physiological responses to aerobic exercise and have shown the effect of training on those responses. Before we finish this discussion, however, we must address isometric exercise, a form of exercise that can have a very different effect on the cardiovascular system. BP responses to dynamic exercise with the increase in systolic BP and HR and the decrease in diastolic pressure. There is very little change in the "mean", or average, pressure during this dynamic form of exercise. In contrast, a simple hand grip held at a tension equal to only about 30% of the person's maximal voluntary contraction strength (MVC) causes a systematic rise in diastolic and systolic BP with only a small increase HR. This is viewed as an inappropriate form of exercise for older people or

those with heart disease because it increases the work of the heart and may compromise the ability of the coronary circulation to meet the heart's oxygen requirements.

Movement Anatomy and Functional Biomechanics Related to physical Activity

Here we will summarize the most important information on anatomy as it relates to physical activity. We will outline the different types of bones, the joints that are the linking points between bones, and the muscles that move the bones as the joints allow.

Bones

The Skeleton consists of more than 200 bones that provide protection for the internal organs and a leverage structure for muscles. The Skeleton also allows for growth and houses the largest store of calcium in the body. There are four classes of bones:

Long bones are found in the arms and legs, and are associated with movement.

Short bones are found in the hands and feet.

Some short bones are irregular in shape like the bones in the vertebral (spinal) column.

Flat bones are found in the upper part of the skull.

Irregular bones are found in vertebrae and the public area.

Joints

A joint is the point at which bones link or connect. Joints are also called articulations, and items associated with joints usually begin with the prefix arthras in arthroscope, a device that doctors use to look into joint spaces of a person with arthritis. Joints are classified on the basis of how much a movement is permitted between the bones:

Syarthrodial joints are immovable joints or those with limited movement, such as the joints between the bones in the skull.

Amphiarthrodial joints are joints with slight movement, as seen in the connections between vertebrae in the spinal column.

Diarthrotic or synovial joints are joints possessing great potential for movement, as in the knee

The diarthroticor synovial joint is most important in physical activity. Movement occurs when the muscle move the bones through a range of motion within the limits of these joints. These joints are held together by connective tissue: ligaments which cross over the joint, and tendons, which attach muscles to bones, also cross over joints to lend additional support.

Because these joints move a great deal, the structure also provides slippery surfaces and a lubricant. The slippery surfaces and a lubricant. The slippery surface in each movable joint is the articular hyaline cartilage that covers the ends of the bones. This cartilage also absorbs some of the shock of impact to reduce the chance the bony surface will wear out. Synovial fluid is the lubricant secreted by the synovial membrane within the joint housing or capsule. In addition, bursae, or sacs containing synovial fluid outside the joint space, help to lubricate the movement of tendons, ligaments, and muscles over bony structures. Some of these joints (e.g; the knee) have additional cartilage in the joint space between the bones to take up some of the shock of impoact. This is the type of cartilage that can be torn as a result of high-impact forces. While the smooth articular cartilage is the type that can be damaged by arthritis.

Diarthrodial (movable) joints are classified on the basis of the type of movement permitted.

Ball and socket joints allow movement in all directions (e.g; where the head of the humerous [the bone of the upper arm] fits into the shoulder).

Hinge joints allow movement in one plane of motion (e.g; the elbow)

Saddle joints allow movement in all directions (e.g; metacarpal-carpal joint of the thumb).

Pivot joints allow rotation around the long portion of the bone (e.g; the radio-ulnar joint: as we rotate a wrist to make the hand face up [pronated position].

Gliding joints allow only gliding or twisting (e.g; the joints between the wrist bones [carpals or the ankle bones [tarsals]).

Movements

The type of movements possible at each joint depends on the type of joint. It is important to know the terms that describe these movements before we present a summary of the muscles involved:

Flexion and extension: Flexion describes a motion that decreases the angle of a joint, and extension is a movement that increases the joint angle. If your arm is hanging straight down, flexion is the movement of your hand toward your shoulder around the elbow joint; lowering the hand back to its starting position is extension. The term hyperextension refers to a movement beyond a joint's ordinary resting position.

Abduction and adduction: Abduction describes a movement away from the center line of the body; adduction is a return to the ordinary anatomical position. Moving the leg to the side away from the body is an example of abduction.

Rotation: Rotation is movement around the long axis of a bone and describes a movement either toward (inward, or medial rotation) or away from (outward, or lateral rotation) the center of the body. With your forearm at a 90 angle relative to your upper arm, and your hand in font of your body, movement of the wrist and lower arm toward the center line of the body is an example of medial rotation.

Pronation and suspination : If you hold your forearm at a 90 angle relative to you upper arm, hand in front of the body with thumb up, pronation describes a movement of the forearm such that the palm turns downward; and supination is the reverse. We also use these terms to describe the maner in which the foot lands with the inside, or medial, aspect of the foot striking first is said to be a "pronator". Many running shoes are designated to control this problem.

Dorsiflex and Plantarflex : These terms describe the movement of the foot from its normal position either towards the lower leg (dorsiflex) or toward the bottom of the foot (plantar flex).

Muscles

Muscles are composed of muscle fibers, which are individual muscle cells. Each cell possesses the capacity to contract when stimulated by a motor neuron, or nerve cell. A single motor neuron may stimulate as few as 10 to more than 100 muscle fibers, and when it does all the fibers attached to that single motor neuron fire at once.

This complex of a single motor neuron and its muscle fibers is called a motor unit. A muscle possesses many motor units, and the tension that a muscle develops depends primarily on the number of motor units called into play. If more tension is needed, more motor units are recruited. When a muscle contracts, the ends of the muscle move towards the center, pulling the tendons(attached to the bones) toward each other. A variety of terms describe the different types of contractions:

Concentric contraction. If the force of contraction is greater than the resistance

Offered, movement occurs as the resistance offered, movement occurs as the bones to which the tendons are attached move toward each other. This type of contraction used to be called an isotonic, or "same-tension", contraction suggesting that tension is maintained throughout the range of motion. However, as the muscles, shortens and the bones change position, the amount of tension needed to move a weight varies; more tension must be developed at some joint angles that at others to cause the same movement. This led to the development of variable resistance, or a accommodating resistance, machines to provide a better match between resistance and the ability of a muscle to exert tension.

Eccentric contraction: If you hold your forearm at a 90 angle relative to the upper arm and a weight (resistance) that is greater than the force your muscles can develop is placed in your hand, extension occurs at the elbow. This is an eccentric contraction in that the joint angle increases even though tension is being developed

Isometric contraction: This is also called a static contraction in that there is no movement even though the muscles are developing tension. Standing in a doorway and pushing against the door jamb is an example of this type of contraction.

The term prime mover refers to the muscles that are primarily involved in the movement at that joint.

Muscles involved in selected activities: In this section we will summarize the muscles group involved in some of the most common physical activities. We will cover both activities of daily living and typical fitness endeavors. Walking, jogging, and running. Walking, jogging, and running have a lot in common; they differ, however, in terms of the muscular force needed to move forward at different speeds. During walking, one foot is in contact with the ground at all times, but in jogging or running there is

a period of "flight" when both feet are off the ground . If a period of flight is involved, a person must expend a greater amount of energy to both take off and land. The primary muscle groups involved in each phase of the activities include the following:

Push – off phase : this phase involves concentric contraction of the hip extensors, talocrural planter flexors, and foot metatarsophalangeal flexors.

Bringing the push of leg forward: Concentric contraction of the hip flexors initiates movement contraction of the hip flexors initiates movement that is modified by the lateral hip rotators. The knee flexors first cause knee flexion, then the knee extensors straighten the knee. The knee flexors continue to act via an eccentric contraction, to control the rate of knee extension prior to the foot touching down. The foot is doors flexed prior to landing.

Landing : The hip extensors that initiated the push-off now contract eccentrically to slow the swing of the forward leg. When the foot touches down the knee extensors also contract eccentrically to control the motion of the foot on the ground.

Cycling: Given that cycling is a restricted activity in that the pedals move in a fixed manner, it should be no surprise that the muscle groups involved in cycling are also somewhat limited. The hip and knee extensors develop the force to move the pedals downward, and if toe clips are used by a cyclist skilled in their use, hip and talocrural dorsiflexors are involved in the return to the starting position.

Jumping: The force needed to propel the body off the ground is generated by the knee and hip extensors as well as the plantar flexors. To absorb the forces of impact, these same muscles contract eccentrically. Lifting Carrying: When a person lifts an object, the large, strong knee and hip extensors should be the primary muscles involved, not the muscles in the arms or along the spine. Keeping the object close to your body reduces the stress on your back

General Biomechanical Concepts

Understanding a variety of basic principles and laws governing the movement of objects and people can help you determine proper and improper movements. In this section, we will discuss the concepts of stability, rotational inertia, and angular momentum.

Stability: The center of gravity for an average person is near the navel. The stability of an individual is greater and the wider the base of support. A person standing with both feet close together is less stable than when standing with feet spread apart, and bending the knees to lift an object brings the center of gravity closer to the ground.

Torque: This is the effect produced when a muscle contraction (force) causes rotation. We will look at forearm flexion as an example, with the forearm at a 90 angle to the upper arm and a 10-lb weight held in the hand. The resistance is the product of the 10-lb weight to the elbow joint. The muscular force needed to move that weight depends on the distance from the elbow that the tendon of that muscle is inserted into the bones of the forearm. The closer their biceps' lar force needed to move the resistance. In the same way, if the person moves the 10-lb weight closer to the joint (to reduce the length of the lever arm), less muscular force is needed to move the resistance. This concept can be extended to the carrying of objects. The reason for carrying an object close to the body is to maintain stability and reduce the force of the back muscles needed to carry the load. If the person holds the object with arms outstretched, however, the back muscles must exert more force, which can cause back problems.

Angular Momentum: This term describe the amount of motion that takes place as a limb moves around a joint or a body rotates and is equal to the product of angular velocity and rotational inertia. The conservation of angular momentum states that once motion is initiated, angular for changes it. This means that a decrease in rotational inertia during a movement results in a higher angular velocity. For example, when an ice skater spins around in place, as he brings his arms closer to his body to decrease rotational inertia, the velocity of rotation increases.

Summary

Muscles use ATP for contraction. Muscles must supply the ATP as fast as it is being used if work is to continue. Muscles can supply ATP from stored creatine phosphate, the anaerobic breakdown of glucose, and the aerobic metabolism of carbohydrates and fats. Although there is an oxygen deficit at the onset of work, at 2-3 min into submaximal work the oxygen uptake needs the entire ATP demand of the task. A graded exercise text (GXT) can be used to evaluate how the various physiological systems respond to gradually increasing work demands. Oxygen uptake increases with each stage of the test until the maximal capacity of the circulatory

system to transport oxygen (Maximal aerobic Power) is reached. This increased oxygen delivery is achieved through increases in hear weight, stroke volume, oxygen extraction, and pulmonary ventilation. With endurance training maximal oxygen uptake increases, due primarily to increases in maximal stroke volume and oxygen extraction. Keep in mind, however, that females have a higher heart rate response to submaximal work than do males because of smaller heart size and the lower amount of hemoglobin in each liter of blood.

The humans skeleton consists of more than two hundred bones; it provide protection for internal organs and leverage structure for muscles. Bones are classifies as short, long, flat, or irregular, with the long bones being primarily involved in movements. Joints are the linking points of bones, and the most important ones for movements are the diarthrotic or synovial joints. The ends of the bones are covered with a smooth articular (hyaline) cartilage, and synovial membranes secrete a fluid into the joint to reduce friction. Diarthrodial joints are classified as ball and socket joints, hinge saddle pivot, glydine. Joint movements include flexion and extension, abduction and adduction, rotation, pronation and supinatiton and dorsiflexion and plantar and flexior. Muscles are composed of many motor units, which are the basic units of muscle contraction. A motor unit is composed of a single motor neuron and the muscle fibres (from 10 to more than 100) stimulated by that neuron. Muscle contraction include concentric, exentric, and isometric, (static). Primary muscle groups involved in selected activites were presented.

CHAPTER - III

TEACHING HEALTH RELATED FITNESS

Fitness is defined as a condition in which an individual has sufficient energy to avoid fatigue and enjoy life. It is also defined as the capacity of the lungs and muscles to function at optimum efficiency (Pate 1983). The content area of physical fitness includes learning experience associated with achieving optimum health through its four components.

Physical fitness can be divided into health-and skill-related components. Health-related fitness focuses on factors that promote optimum health and prevent the onset of disease and problems associated with inactivity. Health Related Fitness includes cardiorerspiratory (aerobic) fitness, muscular strength and endurance, flexibility, and body composition. Skill-related fitness includes balance, agility, coordination, power, reaction time, and speed. To help children develop active lifestyles, health-and skill-related must be taught equally.

The component of Health Related Fitness can be measured separately, and exercises have been designed to improve each specific component. The most important point in physical education is to teach total fitness in ways that develop each of the areas of health-related fitness. Research demonstrates that individuals who engage in regular physical activities to improve the four components of Health Related Fitness increase their basic energy levels and lower their risk for heart disease, cancer, diabetes, osteoporosis, and other chronic disease.

COMPONENT OF HEALTH RELATED FITNESS

A health fitness curriculum integrates physical fitness testing as education. A good physical-fitness curriculum emphasizes the four components health fitness: cardiovascular endurance, muscular strength and endurance, flexibility, and body composition (CDC 1999).

1. Cardiorespiratory Fitness

Cardiorespiratory endurance involves the ability of the heart and lungs to supply oxygen to the working muscles for an extended period of time.

Also called aerobic endurance or fitness, it is the ability of the circulatory and respiratory systems to adjust to and recover from the effects of moderate to vigorous activity, such as brisk walking, running, swimming , or biking . Cardiorespiratory endurance is defined by a concept called maximum oxygen uptake (VO2 max) in other words, how well one consumes oxygen during moderate to-vigorous physical activity.

There are four techniques to help students improve their cardiovascular endurance: continuous, interval, Fartlek, and circuit-course activities. Aerobic activities, meaning "with oxygen", are one continuously, are of moderate intensity, and can be sustained over a period of time. Aneaerobic activities are short blasts of activity done in the "absence of oxygen ". Interval activity includes physical activity that alternates in intensity levels. Fartlek is similar to activity, but with it the terrain (such as hills) controls the intensity levels. Circuit training (circuit-course activity) combines continuous activity with flexibility and muscular strength-endurance activities, providing more variety.

2. Muscular Strength Endurance

Muscular Strength is a measure of the greatest force that can be produced by a muscle or group of muscles. Dynamic strength is the force exerted by a muscle group as the body moves, such as in a push-up. Static strength is the force exerted against an immovable object, such as pushing against a wall. The benefits of increasing muscular strength include a reduced risk of injury as well as improved posture, physical performance, and boy composition. Developing strength requires working against a resistance in a progressive manner. Muscular strength can be improved in children, although they are incapable of producing large muscle masses.

Muscular endurance is the ability to contract a muscle or group of muscles repeatedly without incurring fatigue. The longer a muscle is used, the greater its endurance becomes. Locomoter activities help muscle endurance. The primary objective of developing muscular endurance in students is to enable participation in activity for longer periods of time before feeling muscle fatigue.

Basic guidelines have been established for resistance training and exercise progression in children. Middle school students (ages 11 to 13) should learn all basic weight - and resistance-training techniques and engage in limited progressive loading. Instructors should emphasize proper technique, and may begin introducing more advanced exercises with little or no resistance. High school students should continue learning advanced

exercises, including sport- specific exercises, while increasing exercise frequency. Instructors should continue to emphasize proper technique. As older students master techniques, they can begin participating in appropriate adult programs.

3. Flexibility

Flexibility is the ability of a joint to move freely in every direction or, more specifically, through a full and normal range of motion. Several factors can limit joint mobility, including genetic inheritance, the joint's structure, the amount of fatty tissue around the joint, and the body's temperature. Flexibility can be improved, however, with stretching.

The two most common types of stretching for primary an intermediate level child are static and ballistic stretching. Static stretching involves slow, gradual, and controlled elongation through a full range of motion. Ballistic stretching employs rapid, uncontrolled, and bunching or bobbing motions. Ballistic stretching employs rapid, uncontrolled, and bouncing or bobbing motions. Ballistic technique is not recommended for the general population whose control may be comprised and whose risk of injury may be increased.

4. Body Composition

Body composition refers to the quality or makeup of total body mass. Total body mass is composed of lean body mass and fast mass. Lean body mass includes a person's bones, muscles, organs, and water. Fat mass is fat, adipose tissue. The assessment of body composition determines the relative percentages of the individual's lean body mass and fat mass. The skin fold caliper test is the most accurate method for measuring body composition generally available to teachers, if they are trained to use them.

PRINCIPLES OF FITT

The physical Best program follows the FITT principles for improving and marinating physical fitness. The principles of frequency (F), intensity (I), time(T), and type(T), along with overload and progression, are taught in each health-related concept. We outline them in this section.

1. Frequency

Frequency refers to the number of times a person engages in physical activity that is moderate to vigorous in nature. The prescribed frequency is

related to the intensity and duration of the activity session. There are various standards as to how often one should exercise to improve or maintain physical fitness.

According to the U.S. Surgeon General's Report on physical Activity and Health, physical activity that is moderate to vigorous in nature should be done most days of the week.

2. Intensity

Intensity refers to the speed or workload used in a given exercise period. Intensity depends on the fitness goals of the exerciser and the type of training method being used. Aerobic intensity can be measured by checking one's heart rate. Middle school students should be able to monitor and record their own hear rates. High school should be able to make comparisons and draw conclusions from recorded heart rate data. Including a higher percentage of moderate – to-vigorous activities helps you match the needs of the students. Intensity with activities for muscular strength and endurance is the workload or resistance of the exercise. With flexibility, intensity is the range of motion the joint can achieve.

Intensity is directly related to how long one can sustain activity. Intensity is one of the hardest notions to teach, since pacing oneself is harder than going all-out. Intensity may have to be taught several times to instill safety precautions and to maximize the quality of the activity.

3. Time (Duration)

Duration refers to the number of minutes of physical activity. In cardiovascular endurance activities, duration is the amount of time spent doing the activity. Middle school students can safely engage in physical activity for 20 to 35 minutes at a time. High school students can safely engage in physical activity for 30 t0 40 minutes at a time. When breaking between activities, students should rest for 2 to 3 minutes.

Time is how many repetitions and sets one performs in muscular strength and endurance activities. In flexibility exercise, on the other hand, time relates to how long a stretch is held before it is released. The recommended time for children to be physically active is 30 minutes most days of the week (CDC 1999).

4. Type (Specificity)

What type of exercise is selected is based on the principle of specificity. Specificity of training is the physiological adaptation to exercise

that is specific to the system being worked or stressed during exercise. For example, the specific training exercises a youth does for flexibility do not increase his or her cardiovascular endurance.

(a) Overload

Overload refers to increasing activity, frequency, intensity, or time to improve fitness levels. The body must perform harder than normal to improve. The Overload principle is the basis for considering the variables of frequency, intensity, time, and type. To best explain Overload to youths, let them experience it firsthand-through vigorous activity and by keeping track of how long they sustain activity or has many repetitions they perform.

(b) Progression

Progression is how overload should take place. An increase in the level of exercise, whether it be to run farther or to add more resistance, must be done in a particular progression. This enables the body to adapt slowly to the overload; thus, it eventually makes the overload normal. Your students need to understand that improving their level of fitness is an ongoing process. To help them better understand progression and see that they are improving, give your students opportunities to track their progress. You can help them achieve this understanding effectively through presets and posttests.

FITNESS FOR EVERY ONE

Physical activity, its assessment, and the opportunity to benefit from a health related fitness education program are important to the well-being of all people in society, regardless of their gender, ethnicity, physical competence, or having particular disabilities. The concept of inclusion provides students with positive relationships through their interactions, and these interactions should carry the concepts through to adulthood. The overall mission of the physical educator is to help all students enjoy and learn about physical activity so that they will continue to be active the rest of their lives.

INDIVIDUALS WITH DISABILITIES

Including individuals with disabilities in the physical education settings shows that physical activity is for everyone. It is the responsibility of every professional connecting physical activity programs to explore all options for including people with disabilities in their programs.

All people have equal rights to the health-related benefits of physical activity programs, and the values of these programs accrue equally to all. Participation in physical activity contributes to human growth and development. Emotional and social development flourishes through interaction with peers in play activities, but such opportunities often elude individuals with disabilities. By conducting properly planned and integrated programs, however, trained professionals can provide opportunities for people with disabilities to participate in developmentally appropriate activities.

As a professional conducting the program, the teacher is responsible for successfully including all participants. A leader shapes the attitudes of an entire group. Providing inclusive programs requires you're gaining the necessary knowledge and skills to include individuals with disabilities, being accountable for a positive attitude, ensuring equal treatment across all lines of diversity, and effectively communicating, both verbally and nonverbally.

It is possible that regular physical education may not bean appropriate placement for some individuals with disabilities. Having support from parents, other teachers, a peer tutor, or a teacher assistant can sometimes alleviate disruptive behaviors (which often result in safety risks). However, if a student is not receiving any benefit from regular physical education, continues to be disruptive to others, or continues to pose a serve safety risk, an alternative placement is appropriate. Ongoing evaluation determines whether participation in regular physical education one or more days a week would be more beneficial.

Students with disabilities shouldn't be placed education classes solely for their social envelopment or to have passive roles, such as being a scorekeeper. The major purpose of participation in the physical education is to help students become active, efficient, an healthy movers. Physical education goals as defined include development of gross motor skills, development of fundamental motor patterns, development of health-relate fitness, an development of skills need to participate in lifetime leisure pursuits, including individual an team sports.

Fitness for Individuals With Disabilities: Fitness education an testing programs for individuals without special disabilities have traditionally emphasized a balanced approach, with expectations of achievement in all four physical fitness components. This approach represents the ideal-to maintain health-related standards of fitness in every way, including an active lifestyle.

Some individuals with disabilities, however, may have different lifestyles. For example, some may have great amounts of leisure time; others may have occupations demeaning physical labour, still others, sentry occupations or limited ambulating abilities. The health-related fitness profile for individuals with disabilities needs to personalize according to disability, daily-living needs current activities, and the person's potential.

Programming for Individuals with Disabilities. To plan physical fitness activities that are appropriate for people with disabilities, you must consider the individual's initial or present level of performance. You can determine their present level of performance through a careful assessment of the person's physical fitness needs. The physical Best an Individuals with Disabilities Manual, as well as other resources, provides tools for assessing the fitness level of someone with disabilities (Adapted Physical Education National Standards, NCPERID 1995).

GENDER INCLUSION

Physical education and sport are often gender-based, which can perpetuate stereotypical beliefs and attitudes. Females, in general, have had fewer opportunities and less encouragement than males to be physically active. Physical activity is often more valued in the male domain. However, by eliminating systematic barriers and ensuring all individuals the freedom to develop their own interests and abilities, individuals, groups, and society all will benefit.

Gender-equitable education involves including the experience, perceptions, and perspectives of girls as well as boys in all aspects of education. The inclusive strategies that promote girls' participating also reach boys, who are exclude from the girls' experience, perceptions, and perspectives by more traditional styles of teaching and curricular content.

Physical educators, interacting daily with students, are in an ideal position to promote and affect desirable attitudinal changes in students. In providing a gender-equitable learning environment, you have opportunities to enhance students' sensitivity to gender considerations. Inequity can surface in the general physical education program, in access to resources such as equipment, an in the attention and interactions that teachers and coaches give or have with students. Equipment availability should reflect equal value placed on female and male participation. How educators an coaches organize for activity, assign responsibilities, and speak can either detract from or inspire gender sensitivity.

PRINCIPLES OF GENDER EQUITY IN EDUCATION

- All students have the right to a learning environment that gender – equitable.
- All education programs should be based on the students abilities and interests.
- Gender equity incorporates a consideration of social class, culture, ethnicity, religion, sexual orientation, and age.
- Gender equity requires sensitivity, determination, commitment, and vigilance overtime.
- The foundation of gender equity is cooperation and collaboration among students, educators, educational organizations, families, and members of communities.

The guidelines to ensure attention and nitration for free of gender bias. These include the following.

- Distributing leadership and demonstration roles among all students
- Assigning non stereotypical responsibilities to both genders
- Modifying game rules to involve all students, without losing the essence of the game, and explaining why modifications are desirable
- Handling behaviour problems consistently among both females an males, not using gender-base assumptions as punishments
- Using non-sexist language
- Avoiding the use of gender as the sole criteria for grouping
- Not tolerating or allowing inequitable student-to student interactions of a verbal or physical nature.
- Incorporating several learning styles.

Gender equity is important at all age levels. Educators should ensure that the student-to student interactions are positive. Avoid making or tolerating negative statements, such as calling girls "sissy" or "tomboy". Language cues that are respectful and non-sexist should be the norm. Choosing females and males equally as leaders of groups and as demonstrators can help eliminate gender bias.

To promote gender equity, you can activities that promote a wide movement repertoire for all students. You can provide students with curricular choices to ensure that assessments and intramural activities are not gender-biased.

BENEFITS OF FITNESS

Regular moderate physical activity results in many health benefits for adults. Physical activity has been proven in adults to decrease the risks of diseases that cause morality and morbidity. Although more research is needed on the association of physical activity and health among young people, evidence already shows that physical activity and health among young people, evidence already shows that physical activity brings some health benefits for children and adolescents. It improves aerobic endurance as well as muscular strength and endurance, and it decreases the risk factors that lead to cardiovascular disease. Physical activity among adolescents in consistently related to higher levels of self-esteem and self- concept and with lower levels of anxiety and stress.

PHYSICAL ACTIVITY OF COURSE HAS DIRECT BENEFITS ON A STUDENT'S HEALTH.

Physical activity:

- Makes the heart pump more strongly;
- Helps lower blood pressure and resting heart rates;
- Reduces the risks of heart disease;
- Strengthens the bones and muscles;
- Gives you more energy to do school work, daily chores, and play;
- Help as maintain a healthy body weight; and
- Reduces stress.

It is important to keep in step with the constant changes in our lives. Modern machines, computers, and other conveniences have made it possible to avoid physical activity. Substantial evidence links the adulthood problems of obesity, high blood pressure, and stroke tom failure to develop a physical activity habit during childhood.

Process or Product?

The goal of teaching fitness to students is helping them acquire the skills, knowledge, and attitudes that lead to a lifetime of physical activity. Teaching fitness should be viewed as a long-term process of educating students about physical fitness and the importance of regular activity. The process starts out with achieving lower-order objectives, and it gradually moves to more complex, higher-order objectives that guide students toward

valuing fitness and becoming self-directed. Corbin (1987) refers to this process as the "Stairway to Lifetime Fitness."

The Stairway to Lifetime Fitness is description of hierarchal objectives for a fitness education program. Students move from a level of dependence to independence as they progress educationally through life. As students grow older, they move up each of the five steps toward lifetime fitness. The focus on a particular objective will change as the learner proceeds up the stairway.

Step:1 Doing regular exercise. At this stage fitness scores are not important. Children learn what fun is and learn to love exercise. They will develop personal habits of doing exercise regularly.

Step: 2 Achieving physical fitness. Fitness is temporary. If children achieve fitness goals without obtaining a love for fitness, they will not maintain fitness for life.

Step:3 Personal exercise patterns. At this level students learn what activities they personally enjoy doing and can make decisions about personal exercise patterns that are best are them. What is best for one child is not necessarily best for another. Educators begin to relinquish the decision-making process to the students. The role of the educator is to guide the students in making personal activity choices that are sound and realistic.

Step:4 Self-evaluation. By this stage students realize what activities they enjoy the most. They begin to establish personal habits and patterns of lifetime exercise. To be fully educated, the older students must be able to asses their own fitness, having a basis for making informed decisions bout lifetime fitness. By learning self-evaluation, they can revise their fitness programs as needed.

Step:5 Problem solving. Students know the facts about each of the essential components of health-related fitness and are able to plan their own programs. The students essentially become informed consumers in fitness.

It is the process of exercise that is important when teaching fitness education. If people can do the correct exercises for a lifetime (i.e., as a process) then the product (i.e., physical fitness) will follow. The objectives of teaching health-related fitness are met when the process becomes a regular, permanent part of a person's lifestyle.

LIFETIME IMPLICATIONS FOR HEALTH AND WELL-BEING

There is little doubt that regular exercise is an important part of a healthy style. Most experts feel that children and youths need daily physical activity to keep fit and healthy. We have some information already about the effects of physical activity on improving the health of children and how it can carry over into adulthood. Researchers note that when children engage in physical activity, they mix very short bursts of intense activity with easy to moderate activity. Children have difficulty in exercising at one pace for 20 minutes or longer.

Most researches have reported that the cardiorespiratory systems of children and youths respond to regular aerobic exercise in a way similar to adults. Dr. Thomas Rowland has shown that children can improve aerobic fitness after training, but that the increase is far less in youngsters than adults. As a result of his findings, Dr. Rowland concluded that children often have high aerobic fitness level to begin with, that adults may train more effectively than children, and that the bodies of children may lack the ability to adult and respond fully to regular exercise (Rowland 1990).

Most studies suggest that obese children and youths less physically active than their peers. Long- term inactivity on the part of children increases the likely hood being overly fat. Students who are active and lean have less case of being overall fat later in adult hood. Obesity among youths has been linked to other risk factors for disease such as high blood pressure cholesterol. Studies show that heart disease cancer and other chronic disease are linked to the lifestyles of people and that behaviours are learned in childhood and adolescence.

Physically inactive children and youth who begin to exercise regularly have lower resting blood pressers more favourable blood, lipid profiles. In addition, body fat decreases when exercise programs are initiated among children. One of the most variable health benefits in youth is that when vigorous activity occurs early in life, a higher bone- mineral density achieved. Most bone build up occurs during adolescence, so vigorous activity in the earlier years produce is the risk of osteoporosis later in life. Weight – bearing exercise better of building stronger bones in children than are weight-supported exercises. All of the body's mussels should be exercised to build strong bones.

People begin to acquire and establish patterns of health- related behaviours during childhood and adolescence. Thus, we should encourage young people to engage in physical activity. School and communities can improve the health of students providing instructions, programs, and services and promote enjoyable, lifelong physical activity (CDC 1999).

CHAPTER - IV

PHYSICAL ACTIVITY BEHAVIOR AND MOTIVATION

Over the fast 20 years a lot has been learned about the various health benefits of regular activity. Recently, with realize of the U.S. Surgeon General's Repot on Physical Activity and Heath, research has demonstrated the health benefits of moderate- to- vigor physical activity, more important, the positive preventive health effects that activity has on adults and children. The task now is to promote healthful physical activity among the population. The important issue for promoting activity is to understand the reason and behavioral changes underline a person's level of activity.

Research on physical activity and behavior has examined what influence was physical activity and what effects inter venation a programs have on the activity level of individual. Half the adults population is mainly sedentary. The problem is how to get the active and, once they are active how to keep the going. It is much easier for people to start and exercise program than to continue it on a regular basis. Adults cite has reason fro exercising achieving better weight control, reducing blood pressure, revealing stress and depression finding enjoyment, increasing self-esteem, and improving their social life. Many people choose note to be active, despite social, health and personal benefits of exercising. The reasons these people cite for their inactivity are a lack of time, a lack of knowledge about fitness inadequate facilities and feelings of fatigue.

Personal Situational, behavioral, programative factors determine whether someone adheres to a program or physical activities these determine influence both child and adult participation in physical activity. Studies have shown that influence while growing up also play major role in the adherence activity in adulthood.

Among the personal factors that influence determine physical activity are and individual exercise history knowledge of beliefs in health benefits, and personality. People who participated sports and activity as youngsters have similar adherence patterns. Active youths who receive parent encouragement for physical activity will become more active adults than will be children hood received no such encouragement. Studies show that

high school and colleges experience with sport increases the like hood of exercise adherence adulthood.

Knowing about the health benefits of physical activity is not enough however, to inspire activity adherence. Some adults fail to adhere to exercise programs because of negative attitudes they acquired about physical activity when they where younger, and some adults are imbedded by a lack of knowledge about the appropriate activate. It is important that knowledge health related fitness be an integral part of a fitness education program for adherence to occur later in life.

Self-motivation consistency related to exercise behaviors and adherence. Individuals who are intrinsically motivated tend to adhere to exercise plans than those who rely on external reasons to exercise.

Situational factors can help or kinder regular participation in physical activity. Social support is critical to enhancing adherence rates among people in exercise program. When youths participated in activities, they seek out approval from teachers, parents, and peers. Adults can utilize positive social reinforcement. Time is primary reason that adults give for not pursuing physical activity. Many sedentary people who lack motivation may rationalize that hey lack time. It becomes and excuse for not exercising.

Sport psychologists have studied different techniques to enhance adherence to exercise. The different techniques the develop fall into five non exclusive categories: environmental, reinforcement, goal setting and cognition, decision making, and social support. As environmental approaches they have used prompts, such as signs or bulletin boards for reinforcing the behavior. Having a choice of activities to choose from appears to promote adherence. Reinforcement techniques in exercise adherence must promote self-motivation. These techniques might include occasional rewards, positive feedback, and methods for self –monitoring. Goal-setting techniques should be self-set, rather than having and instructor set them; flexible, rather than fixed; and time –based, rather than distance-based. Using decision making to enhance adherence involves participants in the program in structure. Social support, however, is the most important approach with children and adults who are participating in physical activity.

School physical education probably the most important intervention for promoting students' physical activity and fitness. School physical education is only part of an overall effort to promote desirable physical activity patterns in youths. As in adults, other personal factors figure in

the mix with students, such as biological and psychological influence. Gender is an important determinant in physical activity. From pre-school adults and often into adulthood, boys tend to be more active than girls (sallies 1991). Positive trends among must be encouraged and accelerated to provide them with equal access to and support for healthful physical activity. The decline in physical activity participation is the steepest from childhood to adolescence, and it continues into adulthood.

Knowing how to healthy and physically active in probably more important than knowing why some knowledge may be helpful to start a student exercising, but it is rarely enough to keep to student active. The positive social emotional effects of physical activity are powerful motivators for children, so they are what you should stress.

Social and physical environmental factors influence levels of physical activity not only in adults, but also in adolescences and teenagers. Social influences include peer modeling and support. Peers are very important determinants of children's physical activity patterns. The physical environment is more important in determining physical activity levels outside the school, because physical education programs are usually designed for a particular local climate and the community's resources. Children and teenagers do most of their activity in the context of organized programs such as after- school programs, youth sports leagues, and clubs. When the goal of an organization is to promote lifelong physical activity among students, the levels of adherence to physical activity increase. Television and technology also affect children's activity levels.

All these factors are associated with physical activity levels, so effective intervention must operate at many levels. No single approach is likely to be effective. Children's needs change will age. Special attention should be devoted to girls and to adolescents since their activity levels are relatively low. But it is vital that physical education should prepare all students for a lifetime of physical activity, just as other teachers prepare them for a lifetime of learning and work. Physical education should teach students how to seek other avenues for physical activity and not rely solely on physical education classes.

Motivation

The importance of physical activity in a healthy lifestyle has been recognized for years. Data about the benefits of physical activity to children and youth are scare. Debates continue, for example, about the extent to

which youths and children are active with some of the data's problems reflecting difficulties in measurement. What seems to be emerging, however, is that children's activity levels decline through the teenage years and that boys are more active than girls.

Whatever explanations account for a decrease in activity levels in children, it seems desirable to encourage children's activity for health and developmental reasons. Theorists and researches have attempted to support determination to exercise but little is yet known about the possible determinants of physical activity in children. One explanation is given by social-cognitive theory. This approach to motivation in physical activity involves constructs of self-efficacy (self- perceptions of work or compliments) and, more recently perceptions of success and definitions achievement goals.

Physical education must end maintain lifetime exercise (a process) rather than to improve short-term fitness (a product). Adults tend to talk mostly about the product of physical activity, whereas most youngsters discuss physical activity as a process. Youngsters emphasis being included in activities, being wanted by friends, and participating in "fun". In most cases they learn to value fitness as an end product rather than an ongoing process. Sports Psychologists know this "product" as extrinsic motivation.

Motivation takes two general forms: extrinsic and intrinsic. Extrinsic motivation involves factors outside the individual, unrelated to the task being performed (Ormrod 1995). Extrinsic motivators can be rewards that encourage participation, help children work to full potential, and recognize success. Although these extrinsic rewards do promote achieving activity goals to some extent, they also have numerous drawbacks. Students view the extrinsic rewards, which are used to control or manipulate them into participating, as the reason to participate in events, activities that they might otherwise have chosen to do on their own (Raffini 1993). In relation to physical activity, if a student participates in activity knowing there is a reward at the end, then he or she or accomplishment. Extrinsic rewards, thus, do not promote lifetime physical activity patterns. If teenagers are given extrinsic rewards they tend to focus on the product (the reward) instead of on the process, and they may stop working once the reward has been received. When they choose to participate on their own, however, and experience feelings of competence, then extrinsic rewards may help reinforce those feelings. This is turn enhances their intrinsic motivation to participate in physical activity. The key is to introduce extrinsic rewards in a correct manner at ideal times.

Intrinsic motivation is an individual's desire to perform a particular task (Ormrod 1995). Unlike extrinsic rewards, intrinsic motivations promote long-term behavioral changes more effectively. Students working in environments that emphasize intrinsic motivation tend to view physical activity as a process. This ongoing process can lead them to personal satisfaction and competence.

"Fun" is the primary reason, in terms of the experience of intrinsic pleasure, that students give for participating in physical activity. Fun, intrinsically motivating activities involve four characteristics: challenge, curiosity, control, and creativity (Raffini 1993).. Teachers must empower students to develop the self- confidence to believe they can accomplish certain tasks, the self- esteem to believe they are worthy, and the self-efficacy to believe they are in control of their lives.

For years, students in physical education have been turned off by exercise. Consider why kids are in physical education: to increase physical activity, improve physical fitness, and improve fitness knowledge. To accomplish these goals and help them develop lifetime habits of physical activity, the key is choosing activities that follow the intrinsic feelings and perceptions kids have. Teachers should invoke students' curiosity. If the activity is too easy, kids may become bored. Some bored and frustrated learners may at time need exercise motivation to be convinced to exercise activities need to be developmentally appropriate include challenges spark this curiosity.

As educators give students a sense of control over the activities: Teach basic skill first. If you take the time to instruct students on the proper from and techniques, they can begin to master the basic skills the more decision the students then make in an activity, the more control they have this type of control teaches them self- responsibility.

You must also provide activities that allow students to be creative about contents of the activity. This gives them a chance to use their creative thinking skills. It has additional advantage of including students who are not as active or co-ordinated as well as the more naturally physically adapted. By adding new, exciting equipment for classes you can provide adventure and fun in students activities. Decorating the gym posters, charts, and bulletin boards creates a colorful environment_____just like health clubs and even large corporations display motivational and informational posters.

Students need support and encouragement for their hard work in class. Occasionally provide positive, healthy incentive participation. Expirations of motivation are important. Some examples of words cannot promote feelings of intrinsic motivation are play, excitement, mastery, success, improvement and freedom. Phrase to encourage students may include Great job! Way to go! Terrific! Very creative! and Much better! Gestures also are important in encouraging intrinsic motivation give inn the high five nodding approvingly shake in hands, laughing with a student are always to encourage and enhance intrinsic motivation.

Parental support is considered one of the most important determinacy of child rents involvement in physical activity. Parents can influence their children by modeling physical activity behaviors Biddle and Goudas (1996) showed clearly the importance of parent and teacher encouragement in strenuous physical activity. Parent encouragement created greater adherence to physical activity throw increasing a sense of competence.

In theory and in practice intrinsic motivation is the key to making physical activity life long habit. A teacher's a focus should be to help student internalized motivation and to create opportunities that can give them a sense of accomplishment from within. When intrinsic motivation for physical activity is present the awards prices, and payment become in material. Physical education programme should strongly motivate children to maintain there one fitness. Here, in summary are suggestions for motivating students.

1. Award the process of participation, rather than the product of fitness.
2. Set goals that are challenging yet attainable.
3. Use visual aids to publicize items of interest in fitness.
4. Emphasize self-testing programs that teach students to evaluate their own fitness levels.
5. Do not use fitness-test results for grading
6. Involve the parents

Working toward that happy state in which physical activity sparks the fun, thrill, and excitement in students to carry out continuing fitness activity for a lifetime should be a worthwhile goal for any teacher.

Goal Setting

According to the U.S. Surgeon General's Report on Physical Activity and Health, students should be physically active most days of the week by doing moderate vigorous activity. The guidelines set by the American

College of Sports medicine recommended that a fitness class for any age be at least 20 minutes length and meet at least 3 times a week. It takes good educational programes, caring instructors, time, facilities, and desire to improve for students to feel motivated to engage in life time helpful behaviors. Most school systems do not allow enough time in physical education to make teaching health fitness a priority for most students. Still, its vital to encourage students to become active both inside and outside physical education class room.

Foundation for Goal Setting

At any fitness benefits often requires several weeks of activity, depending on how frequently your class meets each week and the duration of each exercise period. Formal pre-and posttesting should occur too soon too often although frequent and informal self –testing is helpful to monitor progress. A year-long programe will not necessarily result in achieving toys as much fitness as a semester-long program, but fitness planning should be incorporated into the entire program. If you carefully followed all FITT variables, measurable fitness changes might be noted after only nine weeks of class.

Attaining fitness benefits often requires several weeks of activity, depending on how frequently your class meets each week and the duration of each exercise period. Formal pre-and post testing should occur too soon too often although frequent and informal self –testing is helpful to monitor progress. A year-long programme will not necessarily result in achieving toys as much fitness as a semester-long program, but fitness planning should be incorporated into the entire program. If you carefully followed all FITT variables, measurable fitness changes might be noted after only nine weeks of class; however, an entire semester (about 16 weeks) is a more realistic timeframe for including measurable fitness changes, provided the frequency and intensity have been adequate. A six- or nine-week retest is useful as a check on whether the initial goals were realistic. The retest or going self- testing and informal testing results can be used to reset and fine-tune the final goals, scores will naturally changes as a student matures.

The rewards students look for are usually more extrinsic in nature than intrinsic. However, the intrinsic reward of self-improvement brings about behavioral changes that last for a much longer period of time. Goal setting is mechanism hat helps students understand their limits and feel

satisfied with their accomplishments. Using goals created from personal assessments establishes their ownership and fosters pride in the process.

Behavior-modification programs are successful because goals are set and action plans are written to help meet those goals. Action plans help to establish a pathway to that destination. Allowing students to write goals based on their performances teaches them the importance of setting goals. They can apply this little teaching technique easily to other areas of their lives. The types of behaviors (goals) students require for improving health fitness can be determined from a pretest. Without goal setting, fitness scores are just data to summit to an administrator or to parents. By incorporating goal setting into the curriculum, fitness scores become much more meaningful. Establishing goals is a good way to encourage changes in behavior leading to improved health and fitness. Goal setting must be done carefully to successfully enhance motivation.

Goal setting takes experience and practice for both the students and educator. You must consider certain factors when setting goals with students. First, students' fitness levels vary widely. Girls and boys differ in certain fitness variables. Growth and maturation also influence fitness levels. The criteria-level charts provided in the FITNESGRAM program reflect both gender and age differences. The teacher should be sure to use the proper charts when setting goals for each student.

The goals for each student should reflect the individual's level of fitness and fitness habits: greater magnitude of goal for less-fit students and lesser magnitude of goal for fitter students. A fit student will have to work hard to make small gains that bring him or her close to personal potential. A less- fit student, expending the same effort, might show dramatic fitness gains but still remain far below his or her potential. Focus not on comparisons between students but on personal improvement and progress toward personal goals.

Consider also a student's fitness habits. If a youngster has poor flexibility and is already taking part in activities that enhance flexibility in specific joints, then the goals should be set lower than if the same student with poor flexibility rarely does stretching activities. In the second situation, the fact that the student rarely does the appropriate activity opens the possibility that the student might respond well to stretching. In the first situation, on the other hand, where the student already stretches but remains at allow level of flexibility, factors other than exercise might be affecting that student's range of motion. Therefore, goals are always specific to an individual.

Identifying activity habits can also help you find what is likely to motivate a student to participate. And with habits, member that exercise is not the only factor contributing to fitness. Regularly consuming a proper diet, maintaining good sleep patterns, and controlling stress are also important. Discovering a student's habits in all these areas will improve your helping the child to individualize and set realistic goals.

Goal setting can be intimidating and time consuming if you are teacher who has several large classes. Having successful strategies beforehand for teaching students goal setting will help you undertake the task.

Cultural Inclusion

It is important for physical education teachers to know about various cultures because all students are cultural being. A culture encompasses many of the predisposing, enabling, and reinforcing factors affecting students' health behaviors and status. It affects health and activity decisions. As cultures vary, so do notions of what a human body symbolizes; how is should appear; how it functions most appropriately; and why, when, and how it should be treated. Responses about what is appropriate very from culture to culture. Culture values, beliefs, and perceptions influence student abilities to understand, internalize and exercise positive health practices that will enhance there quality of life. A culture can help solve problems and conflicts in the school and in the community, making it worth your while to become acquainted which such values. Giving a student messages that invalidate his or her cultural beliefs or values can damage a student's self- esteem. Goal setting should occur based on cultural beliefs. In some cultures, for example, competitive goals un acceptable for girls, so individualizing goals is better.

Curricular content need not be different when the student population is culturally diverse. Activities that present challenge, risk taking, problems solving, and critical thinking are appropriate at the eliminatory level. Every student should be encouraged to accept various roles in all physical education activities, at the same time respecting cultural values. At the elementary level the curriculum can include movement education and guided discovery activities that pair words and concepts from several languages in movement task, creative dance, rhythmic activities, cooperative tumbling, gems and thematic play. Homework assignments might include studying the contributions to physical education and spot made by individuals (such an Olympians) from various cultures.

Students ability to integrate their personal and cultural selves is valuable skill for change. Modeling the integration of content about the contributions of various cultures is vital; it can demonstrate effective ways of using health information with in the class.

Basic Strategies for successful Goal Setting with Students

First, encourage students to set goals based on where current fitness status rather than on a comparison of their personal status with others. Motivation is related to competence or perceptions of success in a particular area, so basing success on current physical fitness levels allows each student the potential to improve at thus experience success at goal setting. This positive experience will influence the students motivation and behavior. Following several goal-setting guidelines will help motivate students maximally and positively influence their behavior and attitude toward physical activity.

Involve Students in the Goal -Setting Process : Involving students enhances their commitment to achieving their goals and encourages self-responsibility for personal fitness. Scores should be their on, norm-based. Consider the age, maturity level and knowledge level of each student, which should influence the amount of input you use. And, of course, an individuals interests and needs should be part of establishing his or her fitness goals.

Start Small and Progress : Start with a small class. Begin the goal-setting , progress with one grade level(e.g. 6th class if you teach middle school) and continue to set goals with this class as its members progress through the school system. By +2, they will be experienced in setting goals in all areas of fitness.

Focus on Improvements Relative to an Individuals Past Behavior: Take into account the students initial level of performance. The lower the level, of performance, the greater the potential for improvement. The higher the level, the less improvement is possible. If a student has problems with motivation, set the individuals goals at lower increments than you might for student who is already highly motivated. For example, you might need to cajole the less- motivate student more than you would others.

Set Specific and Measurable Goals: Specific and measurable goals are more effective than vague goals (such as "I'll run faster"). For example, if a student wants to run faster and has already completed the mile 9:40, you can help student set a more specific, measurable goal of running the mile in 9:25. Students need some instructions, direction, and practice in

identifying specific, measurable goals. If the goals are not measurable, it is impossible to determine if the student has been successful and achieving them, which defeats the purpose of goal setting.

Set Challenging and Realistic Goals: when you assist students in setting physical fitness goals, take into consideration the child's initial fitness level. Also plan the time carefully between the pretest(to establish the goal) and the posttest (to measure the achievements).The lower the student's initial fitness level and the longer the time between testing periods, the greater his or her potential for improvement. The higher the students initial fitness level and the shorter the time between testing periods to work on fitness, the less potential for improvement. It is important that the goal not be so easy that it does not challenge the student. Most students make their goals too difficult, and their motivation suffers when they cannot attain their goals. It may be helpful to have students practice setting goals and making intermediate goals until they learn more about themselves and their physical fitness levels.

Write Down Goals: Written goals hold more meaning for students and help them focus on what they need to accomplish. If you work with poor readers or dyslexic students, it can help to use alternative methods such as pictures. The appendix contains a sample contract form for recording specific goals. These are masters that can you can use or adapt to fit your program needs. You will also need to spend more time with students who have special health conditions. These students usually need extra guidance or incentives.

Provide Students With Strategies: Students must understand how to change behaviors that detrimental to improving or marinating physical fitness. You can suggest examples of strategies, such as having them ride their bike three times a week, do 25 sit-ups each night before bed, or stretch after the day at school by using a series of stretches that you provide. In other words, provide strategies for improvement. It would be better, of course, if the students eventually develop strategies on there on with your guidance. Learning how to develop goals based on FITT an nutrition is a crucial part of the life long fitness process.

Support and Give Feedback About Progress Goals: An important accept of goal setting that many teachers disregard is giving positive reinforcement and encouragement. Verbal encouragement (such as "I see you have been running one mile every other day. Keep up the good work!", written encouragement (such as note : "Suresh, I was glad to see you in

cycling in the park yesterday- that's a good aerobic workout "), and verbal recognition (such as "Kala has set a great example for all of us by doing her flexibility exercises daily!") can assed in keeping students committed to positive fitness behaviors.

Create Goal Stations: Setting up "goal station" for students helps instill a sense of ownership as the youngsters write there goals. The students can rotate in small groups to work on a particular goals. You can group the students according to their receiving similar scores on their assessments. They will likely have similar goals and provide one another extra motivation and encouragement in achieving the goals. As the enter the class, students cal also work individually at these stations to improve (instant activity). Allowing them to choose work areas places the responsibility for improvement on them.

Provide Opportunities for Periodic Assessment : Periodic reassessment of fitness behavior helps students assess how they are progressing toward their personal goals. Assessment opportunities should occur regularly through out the year. These reassessment opportunities can include informal testing and self-testing, both in schools and at home. Used the information gained through reassessment to evaluate and adjust existing goals where necessary. You and the students will also have the opportunity after reassessments to change their goals and determine whether goal was perhaps too difficult too easy.

Building a Fitness Program Around Student Goals: The physical bes program is a model for establishing goals in physical fitness level , activity participation, and the affective and cognitive domains. Physical best program recognizes the achievement of goals set by students, an important reinforcement for student motivation.

Using goal-setting techniques and strategies helps students have positive experiences through movement activities, feel good about themselves in physical activity, and carrying positive fitness habits for a life time. Physical educators support the students use of goal setting to enhance their lives and fitness abilities.

CHAPTER - V

REMEDIAL ACTIVITIES

1. AEROBIC FITNESS

Middle School Level

Aerobic endurance is the ability of the body's energy systems to carry and use nutrients as fuel and building blocks over a given period of time. Fitness of the circulatory, respiratory and muscular systems is especially important for good aerobic endurance.

Purpose

Students will be able to participate in a variety of continuous aerobic activities and to take their pulse rates at the carotid and radial arteries.

Equipment Needed

- Music tape for work and rest intervals
- Cards defining a variety of aerobic tasks
- 1large six-sided die
- A variety of equipment depending on the aerobic tasks
- Poly-spots (either purchased or made)

Physical Education Standard : Student exhibits a physically active lifestyle- student explores a variety of fitness physical activities for personal interest, in and of physical education class.

Health Education Standard : Student demonstrates the ability to practice health enhancing behaviors and reduce health risks-student demonstrates strategies to improve or maintain personal and family health.

Set Induction

Define aerobic endurance. Ensure that students understand that we determine whether an activity is aerobic by measuring pulse, breathing, or sweating. Review taking a pulse over the heart, at the carotid (neck) artery, and at the radial (wrist) artery. Although this activity concentrates on pulse,

remind the student to think about their breathing and sweating after each activity.

Procedure

1. Set Up four cones at the corners of the playing area and put different colored poly-spots between the cones to connect them, making a game board. Students will roll the large die to see how many poly-spots they move during the game. Activities might include jumping rope forward and backward, step aerobics, basketball dribbling, soccer dribbling, power walking, swim jogging, stride jumping, boxer stepping, volleyball jumping and spiking, and others appropriate to the space available. Make one or more poly-spots a "free" area, where students choose fun activities to do, such as hula hoops, line dancing, or making up their own physical activity. You can use these "free" areas to help ensure that there is adequate space for the other activities.
2. To begin the game, have the students stand on a poly-spot. On your signal the students look at the activity card under their spots and perform the activity listed on that card. They continue until they hear the stop signal or the music stops.
3. Students roll the die again, and they all move either clockwise or counterclockwise that number of poly-spots on the "game board". They look under their new spot and begin that new activity upon hearing the signal.
4. Students will take their pulse rates after completing an aerobic task.

Teaching Hints

Working in pairs may be an option, too. Make the inside rectangle a free are, where students choose activities from the available equipment. After a discussion about aerobic endurance, allow students to create a card for the game board. Use a prepared tape with 60-second work to 15-second rest intervals. Teach the students how to find their radial and carotid arteries. They can take their heart rates at various times during the game for six seconds.

Closure and Assessment

Written and Oral

- Have students identify and write a definition for aerobic endurance.

- Have students list three favorite from this game that were aerobic. Ask them how they knew these activities were aerobic.

Project

- Have students record their pulses on a worksheet after each activity.

Extending the lesson.

- Students prepare a log of heart rates for various activities at home, such as raking leaves, vacuuming, riding a bike, and so on.
- Students research four different activities for aerobic endurance: team and individual sports, recreational games, outdoor activities, and occupations or work. They compare heart rates of people performing the activity, for example, playing soccer, wresting, hiking, cleaning the house, and doing office work.

2 AEROBIC BENEFIT CIRCUIT

Middle School Level

Improving aerobic endurance increases the ability of the heart, lungs and muscles to do work over a longer period of time. Together, good nutrition and physical activity will promote lifelong health benefits and disease prevention. To feel good and enjoy life, physical activity and nutrition should be fun, individual, and pleasurable.

Purpose

Students will understand the health benefits of aerobic endurance and be able to rank the benefits to meet personal needs and goals.

Equipment Needed

Stopwatch
Music
Task sheets
Health benefits signs for each station (e.g., benefits of step benches, cone run, jump rope, ski jump, stair climb, agility run, dribble through cones, hot shot)

Physical Education Standard : Student exhibits a physically active lifestyle- Student identifies the benefits from regular physical activity.

Health education Standard : Student demonstrates the ability to practice health- enhancing behaviors and reduce health risk-student demonstrates strategies to improve or maintain personal and family health.

Set Induction

Ask students why aerobic endurance is important to good health. Brainstorm a list of diseases that can be reduced by regular aerobic activity. Explain that today's activity will give students information to help which benefits are most important o them.

Procedure

1. Develop an aerobic activity circuit with 8 to 10 stations that teach the benefits of aerobic endurance. Items for aerobic endurance health benefits cards could include:
   - reduce illness-jump rope
   - reduce stress-bench step
   - improve appearance-agility run
   - reduce risk of heart disease-core run
   - control weight-ski jump
   - increase enjoyment of life-core dribble
   - have more energy-stair climb
   - increase self-discipline-speed jump]
2. When the music starts, students will walk or jog laps around the gym for 15 to 30 seconds. When the music stops, the students choose a health benefits station, read the health benefit, and perform the activity at the station for 60 seconds. When the music begins, the students repeat the walking or jogging, then rotate to another health benefits station and perform the activity.
3. The activity continues until the students perform the number of station choices you decide.
4. At the end of the activity, students record their choices and discuss why they chose those benefits, either in a journal or in class.

Teaching Hints

Start students at several spots before they jog. You can use task sheets or not depending on the number of stations the students choose. If too many students choose one station, they can stimulate the activity or

share the equipment at the station. The important concept is not the workout, but the health benefit choices they make.

Closure and Assessment

Written and Oral

- In a journal, have the students list five personal benefits from participating in aerobic activity, and explain which three are most important to them and why.

Project

- Encourage students to participate in some form of physical activity after their next stressful situation. Have them describe in their journals the feeling during and after this stressful experience and whether exercise helped them ffel lower stress.

Extending the lesson

- Students develop a timeline prioritizing their health risks. Ask them if their benefits might change in priority over the years, and what things (other than just age) might cause any such changes.
- Students list the heart attack risk factors and how activity affects each. Determine which risk factors are controlled and which are not.

3. 10-MINUTE TICKER TASKS

Middle School Level

Time is how long you need to be aerobically active to improve maintain aerobic endurance. You should accumulate at least 30 minutes of aerobic activity most days of the week

Purpose

Students will understand that an increase of time in Aerobic activity maintains or improves aerobic endurance. Research shows that 10-minutes buts of aerobic activity are beneficial, and students should work to accumulate at least 30 minutes a day.

Equipment Needed

Depends on the activities you choose

Physical Education Standard : Student achieves and maintains a health-enhancing level of physical fitness.

Health Education Standard : Student demonstrates the ability to practice health-enhancing behaviors and reduce health risks-Student demonstrates strategies to improve or maintain personal and family health

Set Induction

Discuss the relationship between time and intensity. Explain that intensity is measures throughout an activity, while the time is measured only at the end.

Procedure

1. Design a variety of motivational aerobic fitness tasks to meet the needs and interests of you students. Include 10-minute tickers as a way to begin or end a lesson. This could be a weekly event to measure aerobic fitness improvements. If heart rate monitors are available, use them during this activity. Here are some examples of 10-minute tickers tasks:
   - Using the steps, students choose 10 different movement and perform each for 1 minute.
   - Students play 1-on-1 or 2-on-2 basketball and check their heart rates three times during the game.
   - Students practice their favorite hip hop, country swing, or aerobic dance with their friends.

Using the jump rope, students check their skills with s skill sheet.

   - Students jog the track and pass a football to a partner. They take turns running pass patterns.

2. Have students keep a fitness journal or log of accomplishments to meacureto evaluate improvements.

Teaching Hints

This is an excellent way to allow students to choose a task and experience individual successes. It allows total inclusion of a variety of development levels. Make sure to include a warm-up and cool-down this activity.

Closure and Assessment

Written and Oral

- Have students explain how to accumulate different activities to meet the 30-minute goal.

Project

- Have Students create a one-week aerobic fitness plan based on accumulating fitness activities in 10-minute segments. Ensure that the plans include a variety of activities

Extending the lesson

Students develop a list of 10-minute ticker activities for three weeks, including write in their journals a log of 10-minute ticker a activities for three weeks, including activities such as mowing the lawn, shoveling snow, dancing to music, and so on. Students measure resting heart rate, target rate, and recovery heart rate during each activity.

4. JUMP, STEP, JOG

Middle School Level

Progression is a sequential change in frequency, intensity, and/or time. Overload is an increase in frequency, intensity, or time beyond the body's normal capacity. Levels of overload should be based upon an individual's fitness goals.

Purpose

Students will identify one fitness principle that they can alter to demonstrate progression.

Equipment Needed

- Jump ropes
- Steps
- Music tape

Physical Education Standard: Student achieves and maintains a health-enhancing level of physical fitness-student understands and applies training principles to improve physical fitness.

Health Education standard : Student demonstrates the ability to practice health-enhancing behaviors and reduce health risks-student demonstrates strategies to improve or maintain personal and family health.

Set Induction

Define progression. Discussion how progression relates to intensity, specify, and time. Explain that this lesson will show progression over s short period, although progression actually occurs over a longer period.

Procedure

1. Students work in groups of three. One student will jog, another will jump rope and the third will perform step aerobics.
2. se a segmented music tape (30:10 seconds). When the music is on, students perform their aerobic activity. When the music stops, students rotate to the next activity.
3. Continue until they have participated in all three aerobic activities .
4. On day two, use a 40:10 second music tape to increase the time students participate in aerobic activities.

Teaching Hints

On day one, have students work in groups of three. On day two, students can choose the aerobic activities they wish to participate in. Brainstorm with students about what other activities they can include in the circuit. Include some of their activities in the circuit the rest of the week.

Closure and Assessment

Written and Oral

- Students identify and write a definition for overload.
- Students identify and write a definition for progression.

Project

- Students choose an activity they would enjoy participating in to keep the heart, lungs, and muscles fit. Using this activity, students develop a list of waysto work harder and do a little more each exercise episode.
- Explain how students can demonstrate the concept of progression for each exercise in the jump, step, jog activity.

Extending the Lesson
Given three scenaries (e.g., Susie's, Sam's and Sarah's story), have students design strategies for each that will result in progression.
Susie's story: Susie has asthma, but can do limited aerobic activity. Her baseline 3 minutes of activity on the PACER. She wants to improve to 5 minutes.

- Sam's story: Sam is on the basketball team. He wants to play longer without getting so tired.
- Sarah's story: Sarah can run one-quarter mile without stopping. She wants to run one mile without stopping.

5 WARM-UP/COOL-DOWN

High School Level

Warm-up is the beginning phase of the training session in which you prepare the body for activity. Proper warm-up helps prevent injuries by loosening and stretching muscle fibers and connective tissues (tendons and ligaments). **Cool-down** is gradually tapering back, almost to a resting phase, after completing the cardiovascular phase of training. Proper cool-down helps prevent injuries by allowing muscles to flush wastes generated by exercise.

Purpose
The students will learn how warm-up and cool-down activities affect the heart rate. They will learn how important it is to keep moving after moderate-to-vigorous activity to prevent blood from pooling in the extremities.

Equipment Needed

- Stopwatch
- Paper and pen or pencil for each student

Physical Education Standard : Students achieves and maintains health-enhancing level of physical fitness-student designs a personal fitness program.

Health Education Standard : Student demonstrates the ability to practice health enhancing behaviors and reduce health risk-student demonstrates strategies to improve or maintain personal and family health.

Set Induction
Review the need for a complete warm-up prior to exercise. Explain that the heart is a muscle that also needs to be warmed up.

Procedure

1. Students develop a workout plan for improving their aerobic endurance based on their needs and goals. The plan should include both a warm-up and a cool-down.
2. Students then test their workout plans. They will record their heart rates after each step in the plan, including the warm-up and cool-down.

Teaching Hints
To demonstrate the effects of not cooling down, have the students immediately sit down while taking their 1-minute heart rate. Do not use a 6-,10-,or15-second count for heart rate, because the best way to see the results of a cool-down is to take a 1-minute heart rate.

Closure and Assessment

Written and Oral

- Have students distinguish among the heart rate at rest, during warm-up, and during aerobic activity.

Project

- Have students record the data for their 1-minute heart rates from participating in warm-up and cool-down activities for several days.

Extending the Lesson
Have the students compare their recorded warm-up and cool-down heart rates over several weeks. Is there any difference?

REFERENCES

For the details of References mentioned in this Book,
please contact manojti@gmail.com
or
g.bipin@yahoo.com.

SPORTS FOR ALL
HEALTH FOR ALL

സമ്പൂർണ്ണ കായികക്ഷമത
ആരോഗ്യകേരളത്തിന്