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CONTENTS

MEDICINE ORGANIZED BY TURKISH NATIONAL SPORTS MEDICINE FEDERATION, İzmir, 5-7/6/1981

The Opening ceremony was held at Ege University Atatürk Cultural Center in İzmir Hall 5.6.81 at 17.30. After the opening speech of Prof.Necati Akgün, President of Turkish National Sports Medicine Federation, The Minister of Youth and Sports Gnl. Vecdi Özgül spoke. Afterwards one delegate each from other Balkan Countries gave their speeches. It was followed by the Concert of İzmir Philharmonic Orchester, conducted by Hikmet

Şimşek in which the Orchester Suite «Katibim» composed by Bülent Tarcan, Prof. of neuro Surgery in Istanbul University Medical School and also Egmont ouverture by Beethoven were performed.

Same evening the delegates met in coctail given by Ministery of Youth and Sport in Fuar Ada Gazinosu and there student folklore team of Ege University, School of Physical Education and Sports performed some selected folk dances.

Scientific sessions began on 6 June at 8.30 in the Cultural Center. During these sessions 5 main themes and 30 free communications were read. Simultaneous translation in English and Turkish was provided for the delegates to follow the communications; from Bulgaria 8, Greece 8, Romania 8, Yougoslavia 5 and Turkey 75 members, also 2 members from Great Britain took part in the congress. The proceedings of the congress is going to be published in our Journal begining with this issue.

Among other social activities of the congress there was a cocktail by Egean Chambers of Industry and Commerce in Fuar Tennis Club 6 June evening.

7 June in the afternoon an excursion to Epheeus and Kuşadası was also organised.

OPENING SPEECH OF THE PRESIDENT OF TURKISH NATIONAL SPORTS MEDICINE FEDERATION

Prof. Dr. Necati AKGÜN

Your excellency, The Minister of youth and sport

Dear delegates, guests and Ladies and Gentelmen

On behalf of the Turkish National Sports Medicine Federation and the Organizing Committee, I would like to welcome you to the Vth Balkan Congress of sports medicine.

The Balkan Association of Sports Mediicne has been created to realize a close collaboration between Balkan countries in the field of sports medicine. One way of this realization is holding the scientific congress in member countries. Every two years we held such a congress in one of the member countries. We feel very happy in organizing this scientific meeting this year in Turkey. This is the Vth Balkan Congress of Sports Medicine, but in reality this is the first international sports medicine congress to be held in Turkey, and I am sure this will be a historical landmark for us.

They say that sport is an instrument of international peace and an instrument for bringing people together. I must add that our sports medicine congress have also the same purpose.

I hope this meeting will be another occasion, like the previous congresses, for forming new academic friendships.

During the meetings the following themes will be presented and discussed; Women and sport; Sportive Orientation in children; Football injuries, Therapy and rehabilitation; Wrestling and Sports Medicine; sports and hormonal regulation. In addition to these topics several free papers will be presented.

I have no doubt that the meetings and discussions will be full of interest and I hope they will provide useful information for all interested people.

We had some difficulties in preparing the program book, because of some delayed presentation of abstracts, but I hope that after the congress we will be able to publish all the presented papers in a special volumes of the Turkish Journal of Sports Medicine.

I would like to take this opportunity to express our sincere thanks to the Ministry of Youth and Sports,

Turkish Sports Fund,

Spor Toto

Industrial and Commerical Establishments,

Izmir Sports Writer's Association,
sports clubs for their generous support.

and also I extend warm gratitudes to the

Ege University for oppening the doors of this new convention hall and to our famous conductor Hikmet Şimşek and the members of the state symphonic orchester of Izmir.

Thank you.

OPENING SPEECH OF MINISTER OF YOUTH AND SPORTS

GEN. VECDİ ÖZGÜL

Ladies and Gentlemen,

It is a great pleasûre for me to address the distinguished members of the Fifth Balkan congress of sports medicine. I particularly welcome the delegates of the neighbour countries.

This congress has a special meaning in the development of sports for the participating countries. Sports gain greater value everyday in the moral wellfare and in the social structure of a nation. Sports is not a physical competition only in which the winner enjoys a pride of superiority.

But it is the means to develope physical health and skill, it is the means to help the youth to free themselves from idleness and to let them involve in better occupations, and furthermore it is the means to promote better relationships among groups communities and nations.

Sports with this characteristics is getting to be a function in which more people are involved more and more. Popularity of sports among the people and mass movements, also help to raise healthier generation which results in the improvement of competative sports as well.

Today the competative sports require the utilization of human effort and performance in the highest degree. This could be achieved by the care of sports medicine and this is one of your major occupations. without medical assistance it could not have reached to the level achieved today.

I quote from association is constitution "The basic aim of the association is actively to promote the creation of correct, scientifically based arrangement of sports activities, physical education and recreation as a powerfull factors for structural and functional perfection, health strenghtening and prolongation of man's creative activity".

Thus one of the major task of this congress will be to discuss scientifically and exchange ideas on the latest developments in medico-sports. I am confident that your studies will be in the way of professionaly perfection, and mutual benefit will be achieved to the highest degree.

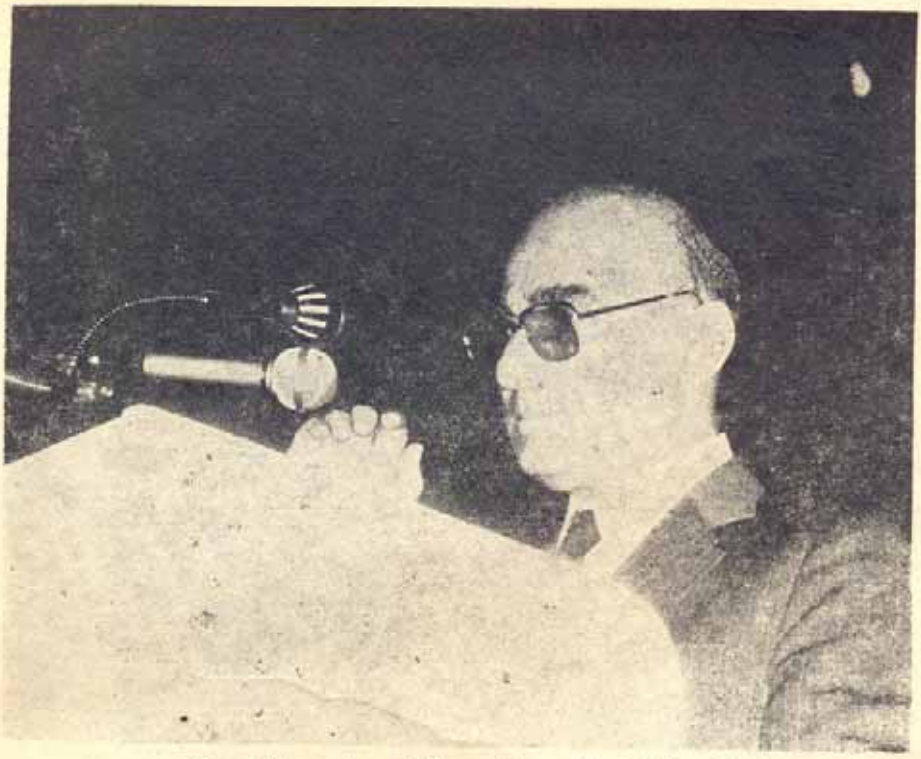
On this occasion, I would like to express my satisfaction in regard to improved relationship among Balkan countries. In fact, the social aspects of this type of gatherings is as important as the professional side of it. The friendship and the associations established in such assemblies help all participants to understand each other. I am certain that this congress will not limit itself to the professional discussion only, but will also help to improve the existing good relationship between our countries.

In this region, Balkan countries have closer and easier access to each other, and traditional sports activities exist between them. Therefore I encourage our federa-

tions to organize more activities. With our neighbour countries in the Balkans.

With all these considerations in mind I'm again confident that your contributions will not be limited to medico-sports area but will help promote better relation. ship among colleagues.

I thank you very much for your participations and contributions to the Fifth Congrees of Balkan Sports Medicine. I wish you good success and I hope your stay in Izmir will be enjoyable.



Gençlik ve Spor Bakanı Gen. Vecdi Özgül
konuşmasını yaparken

Women and Sport

Dr. Necati AKGÜN*

According to the literature we know that females have not participated in athletics to a large extent in the past. But now competitions for females are expanding for all ages, at all levels and in all sports and even they are very successful in some events. Actually in the USA, of the 5.5 million high school youth competing in the interscholastic athletic competitions in a broad program, including 36 sports, nearly 2 million were girls (6). Girls participation has increased 26.6 % since 1976. There are now more working woman and working women participate more in exercise and sports than those who are not working.Within the Council of Europe, the European ministers responsible for sports decided, at the 1981 April meeting (7), to take all appropriate active policy measures in their countries to encourage greater involvement of women in sport. They have accepted that although women have traditionaly been less involved in sport than men, they have an equal right to participate, to decide for themselves the type and level of sport which they wish to practise and to be equally involved in the promotion and management of sport. They have also noted that the present unequal rate of participation of the sexes is the results of sociological patterns and traditional attitudes rather than physiological factors, (17). In Belgium, 1980 was accepted as the women's sport year.

Scientific data on the female athlete were alsó sparce in the past. But now investigations and publications related with women's sport are increasing every day, therefore our knowledge is becoming enriched. Womens have some physiological, morphological and also some performance characteristics compared with men. It is wortwhile to summarize these particularities.

Morphological particularities

Although genetic inherited traits are important for success in sports, the morphological characteristics are of interest to demonstrate the relationship between structure and function. Prior to puberty boys and girls are virtually equivalent in height and weight. Postpubertal boys are taller, heavier and stronger than girls on the average. Body proportions are different in women. The trunk is relatively long the extremities are relatively shorter (particularly for hands), hands and feet are smaller in the absolute and relative sense. The elbow angle is greater by 10° to 30° against 0° - 9° in men (hyperextention of elbow). Physiological x position of the legs is quite manifest when the legs are

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particularly short. (convergence of femur, genu valgum) (3,4,8,21).

Locomotor system

Muscles: There is greater extensibility, softer consistence, physiological sections less great in the absolute and relative sense. Muscle tone and ligaments are weaker. Muscle mass is relatively less than that of men. Fiber composition of the muscle does not have a sex difference (3,4). Until the onset of puberty, strength is quite similar in boys and girls of the same biological age. But after puberty overall total body strength of women as compared to men is about 63.5 %. This value may range from 35 % to 86 %. Static strength in the upper extremities of women was found to be 59.5 % (44-79 %) that of men. Strength of the lower extremities of women was found to be 71.9 % (57-86 %) that of men. Womens' trunk strength was found to be 63.8 % (37-70 %) that of men. The dynamic strength characteristics, which included lifting, lowering, pushing and pulling tasks, of women was found to average 68.6 % (59-84 %) that of men (29). Like men, women respond to weight resistance programs with increases in strength and muscular endurance. Brown and Wilmore (4) showed that women are capable of responding to strength training with considerable increases in strength and only minimal evidence of muscular hypertrophy. Muscular hypertrophy is regulated mainly by the hormone testosteron which is found in much higher levels in normal men than in normal women .

Body fat: Body fat is more pronounced relatively and absolutely in women than in men. Much of the differences in performance between individuals and between males and females possibly can be explained by differing amounts of fat and lean body mass. On the average the female posseses twice as much measurable fat as does the male, i.e 20 % to 25 % for female and 10-14 % for male (9).

The significance of the amount of fat lies in the high relationship between lean body mass and strength and endurance. The higher percentage of fat in females means a lower percentage of lean body mass available for use in competition. Excess body fat decreases performance in relatively prolonged weigth-bearing work such as distance running by increasing the body weigth and therefore the energy required to perform any given level of work without contributing to the body's energy capacity. Body fat reduces the aerobic capacity expressed relative to body weight, thereby lowering the oxidative energy metabolism that can be made available to move each kilogram of body weight (10). Female athletes possess a wide range of percentage fat values and these values vary greatly according to the sport discipline. Haymes and Dickinson (22) have studied fifty four members of the U.S. ski teams and found that, in the discipline of alpine, female and male skiers had 20.6 % and 10.2 % relative body fat respectively. On the other hand the mean values of body fat(%) of female and male cross country skiers were 15.7 and 7.9 respectively. Dale et all(11) found that female runners have less adipose tissue than non running females (17.4 % versus 24.0 %). Wilmore and Brown (37) studied women distance runners and it is found that mean relative body fat was 15,2 %; Which is approximately 50 % of the value normally found for females of the same age but more than 100 % above the values found for men endurance runners of a similar age.

Bone : Bone density is less in women than in men. Ossification of postnatal epiphyseal centers begins earlier in females than in men. Because of their earlier maturity, women have fewer epiphyseal injuries about the knee than men. Distal femur, proximal tibia, and patella of women are smaller than in men of comparable size. The cortices are thinner and the total trabeculae are less in volume with the individual trabeculae smaller and more delicate in females than in males. Articular cartilage is thicker in males. Menisci are smaller in women but there is no anatomic structural sex differences for menisci (33).

Tendons : Women have smaller tendons compared to those of men. With smaller tendons there is less friction, less mass and increased mobility of articulation. Muscle hypotonie and hyperlaxity of ligaments provide to the articulations more mobility at any age. Therefore movements of articulation are more subtle supple) and wider in women.

Vertebral colomn : Thoracal hyphose and lumbal lordose more pronounced.

Shoulders : narrower in the absolute and relative sense (34).

Pelvis : Lower, more flat and larger (width 55 % of trung lenght against 50 % in men). Because of the greater distance between hip joints x legs in women is a physiological phenomenon. The higher inclination of the pelvis is responsible for the more pronounced lumbal lordosis (34).

Circulatory and respiratory systems :

Lungs : The lungs are smaller in the absolute and relative sense. The transversal section of the respiratory tract (airways) are equally smaller relatively (34).

Vital capacity is smaller, resting respiratory frequency is higher, maximal value of ventilation and Oxygen uptake are smaller.

Heart : Heart volume is absolutely and relatively smaller (600 ml against 800 ml in men). Systolic volume is smaller. Smaller systolic volume may be compensated by a higher heart rate (34).

Blood vessels : Arteries are narrower and their walls are thinner but vascular net is denser. The veins seem to have a more pronounced tendency for varicose formation (34).

Blood pressure : There is a litte sex difference (34).

Hemotological and biochemical values:

Levels of cholesterol, total bilirubin, albumin, total protein, uric acid, alkaline phosphatase are approximately the same in men and in women. Women have lower levels of creatinine phosphokinase, inorganic phosphate, fasting blood glucose, acid phosphatase, plasma testosteron, eryth rocytes, hemotocrit, hemoglobin concentration, serum iron, urine 17 - ketosteroid, urine 17-hydroxy steroid excretions. Basal metabolic rate is also lower than in men (38).

Nervous system : The reaction times of motor and neurovegetative centers are more rapid (34).

Psychic situation : Emotivity, in general, is more pronounced in women than in men (34). This greater emotivity may have some consequences in competing women. Therefore this property should be

taken into consideration in women's training and in competition.

Aerobic capacity

According to many authors the maximal aerobic capacity of the average women is less than that of the average man and man has a decided advantage. On the average, men exceed the women's max VO2 by 20-25 % when VO2 max is expressed as ml O_2/kg/min.

Cardiovascular and ventilatory responses of women to exercise :

It is important to know whether or not womens response to exercise differs from men's response and also whether or not sex is one of the factors in the women's response;

White and Young(36) investigated the effect of a 12 week physical fitness program on selected cardiorespiratory and body composition measures in non-obese young and middle aged women (n=30, ages 21-57) ,and showed that the activity program increased vital capacity in both groups, submaximal heart rates were decreased in both groups, resting heart and body fat were decreased in the middle aged group cardiovascular and respiratory responses of women to exercise were not found different from that of the men. Daniel et all(12) studied cardiovascular, metabolic and ventilatory responses of women to equivalent cycle ergometer and treadmill exercise on 18 females subjects between the ages of 17-40 and they have showed that central and peripheral cardiovascular responses of females to exercise on the cycle ergometer and treadmill at equivalent levels of metabolism are very similar to that of the men. Flint et al (18) investigated the effects of a 6 week program of physical training on 7 females aged 23 to 49. Training effects were determined by responses to a standard submaximal load (70 % VO2 max) and by the increase in predicted VO2 max following training. Heart rate, O_2 pulse respiratory quotient (R), excess CO2 production all showed significant training effects. No change were noted in VE, respiratory rate, ventilatory efficiency, systolic and diastolic blood pressures. Maximal aerobic capacity increased 12% following training. The conclusion of the authors was that there are no striking differences between the sexes in their physiological responses to a physical training program. Massicotte et al (30) have carried out a comparative study on a mixed population (23 males 11 females aged 20-55) a 20 week training program of the same type, same frequency same duration and some intensity relative to sex and initial physical fitness levels has resulted in the same physiological effects on both sexes. And they have concluded that there was no sex-related difference in the physiological adaptations to physical training. Brown et al (3) reported the effects of a strenuous cross - country training program on very young girls, ages 8 to 13, before and after 6 and 12 weeks of training O_2 max was increased 18 % at 6 weeks and 26 % at 12 weeks. It is concluded that preadolescent girls responded to endurance training in the same manner as older athletes. As Kilbom (27) stated several years ago, there is no difference of sex in the ability to profit from physical training. Women are as trainable as men.

Physiological profiles of women endurance runners :

Jordan et al (25) have carried out echocardiographic investigation on 10 male

and 10 female marathon runners. They have found significant differences between men and women in absolute measures of left ventricular internal diameters (endsystole and enddiastole) enddiastolic volume and endsystolic volume, stroke volume. But when these measures were indexed for body surface area, the differences were not significant. According to these investigators women marathon runners have relative cardiac structural dimensions equal to those of men marathon runners. Therefore with respect to cardiac adaptation to marathon running, the men and women are equal. Wilmore et al (37) measured the body composition and cardiovascular endurance of 11 women long distance runners (mean age 32,4 years) and compared the results with those obtained from male endurance runners of similar age. They have found Vo2 max averaged 59.1 ml/kg/min. which is considerably higher than normal values for women. This is 16 % lower than the value reported for men marathoners. But this difference is reduced to 7.8 % when expressed relative to lean body weight. Although female endurance athletes have a lower endurance capacity, this difference was decreased when capacity was expressed relative to lean body mass. According to Cureton and Sparling (10) one of the factors responsible for the sex difference in distance running performance is the greater average relative body fatness (% fat) of females.

We can assume that collected data show that there are no striking differences between the sexes in their physiological responses to physical training program. For that reason the American College of Sports Medicine (1) has published and distributed an opinion statement that females should not be denied the opportunity to compete in long distance running. There exists no conclusive scientific or medical evidence that long distance running is contraindicated for the healthy trained female athlete.

Athletic activity, menstruation and pregnancy

The effect of the menstrual cycle on sportive performance has been questionned in the past. This kind of investigation has been carried out particularly on swimmers (16) and they have found that menstruation does not have any harmfull effect on sportive performance. Korean women divers (24) (These divers are called amas) dive regularly even in the winter season and some times during their menstrual period with no particular menstrual protection and their menstrual cycle has been found quite regular. On the other hand, there is evidence that persons who experience dysmenorrhea can receive relief from a therapeutic exercise program. Complications of pregnancy and childbirth are fewer in female athletes than in nonathletes. Pregnancy does not adversly affect athletic performance and vice versa. There is no evidence that a normally established pregnancy in a fit women is threatened by exercise. Physical fitness during pregnancy contributes to ease of parturition and childbirth is generally easier in fit women. On the other hand Dale et al (11) have studied female distance runners and found that strenous training has some effcts on the menstrual cycle. They have noted that dysfunction in some distance runners is a real phenomenon. According to these authors this dysmenorrehea related to decreased percentage of body fat of distance runners and/or minimal ovarien

function secondary to diminished hypotha lamic or pitiutary hormon secretion. During the Tokio Olympics (39), a survey of 66 sports women was made to determine if there were any menstrual difficulties as a results of training and competition and what effect the menstrual cycle had on performance. Approximately 41 % of the women reported some menstrual disturbances during training or competition but only 17 % felt their performance was adversly affected. Reported menstrual dysfunctions can be accepted within normal limits. Finally one can say that according to many authors the menstrual period in general does not effect sportive porformance and physical training does not effect the menstrual cycle.

Strenuous physical training and the growth of girls

Longitudinal studies (16) related to the effects of strenuous swimming training on the girls, physical mental health and development showed that girls were advanced in growth taller in relation to age somewhat early menarche. Their functional development was also advanced and they were extroverted, and energic. There were no growth and menstrual disturbances. Knowlton and Weber (28) collected data on a young woman during a 17 mounth period in which she was training for the mile and 2 mile events. There were noticeable improvements in her cardiovascular function and there was no observed harmful effect.

Heat acclimatization in women

The thermoregulatory responses and acclimatization mechanisms of women to exercise has been the subject of several studies. It has been also investigated whether or not sex difference has a role in the thermal responses of women. Some studies showed that women are less heat tolerant than men, particularly when physical work is required. Untrained women exercising in a hot environment show a greater degree of cardiovascular strain, higher heart rates and lower stroke volume than males working under similar conditions. According to several reports about thermoregulatory responses at rest (2,20,25) or during work (14,22,34), women had lower sweat-rates, higher core temparature during heat exposure than men. Fortney and Senay (19) studied the thermal responses of 9 females to moderate exercise (40 % VO2 max) on a cycle ergometer in a cool (16°C - 20°C, 30 % rh.) and a hot (45°C, 30 % rh.) environment before and after a 4 week training program and heat acclimatization in order to explain why females experience greater strain than males during exercise in the heat. They found that training improved cardiovascular fitness level and that during acclimation the sweat rate increased and the mean skin temperature significantly decreased. These investigators concluded that the limiting factor of endurance in these women appeared to be of cardiovascular rather than of thermoregulatory origin. Fox et al (20) reported also that a possible reason for the higher level of strain in females is a lower level of fitness. Dill et all. (15) Paolone et al (32) have reported that physically fit women apparently can accomplish a work task as well as men in a hot environment with a lower body temperature. Christine (5) has studied 5 physically active men and 6 women in a temperate environment and in an outdoor desert environment during rest and exercise at 50 % VO2 max. No difference between the groups occur-

red in VO2, HR or Tre in either environment. No difference occurred in evaporative weight losses, sweating rates or % body weight losses in the heat. It was concluded that women accustomed to exercise in a desert climate are able to subtantially increase their sudorific response and that acclimatized male and female subjects of similar aerobic capacity have compaarble responses to rest and exercise in a desert enviroment. According to Nunnely (13) acclimatization mechanisms are not different in women than men. Davies (13) investigated thermal responses to exercise on male and female subjects and he has found that sex and age difference in temperature regulation are more readly explained in terms of exercise capacity, rather than thermoregulatory function. Dill et al (23,15) have studied young males and females in desert heat and concluded that the superior capacity of males over females for substained exercise in desert heat is related to their higher aerobic capacity and not to a difference in capacity and not to a difference in capacity for thermoregulation. In summary we may assume that the female does not have different thermoregulatory responses to exercise than men.

Altitude effects

In general the proportional reduction in endurance performance was the same for women as for men (Mexico 1968).

LİTERATÜR

1. American College of Sports Medicine opinion statement on the participation of the female athlete in-long distance running. Med. Sci. Sports, 1979, Winter, 11(4), IX-XI.

2. Bittel J. and R. Henane. Comparison of thermal exchanges in men and women under neutral and hot conditions. J. Physiol. (London), 250 - 489, 1975.

3. Brown C.H., J.R. Harrower and M.F. Deeter. The Effects of cross country running on pre-adolescent girl. Med. Sci. Sports 4, 1-5, 1972.

4. Brown C.H. and J.H. Wilmore. The effects of maximal resistance training on the strength and body composition of women athletes. Med. Sci. Sports 6, 174-177, 1974.

5. Christine L.W. Responses of physically active and acclimatized men and women to exercise in a desert environment. Sci. Sports and exercise. 12, 9-13, 1980.

6. Conrad C. Executive director of P.C.P. F.S., Washington D.C. 20201.

7. Council of Europe. Greater involment of women in sports. MSL-3(81), DR 12.

8. Council of Europe. Sports for women-Medical aspects. CDDS (79) 32.

9. Cureton K.J., L.D. Hensley and A. Tiburzi. Body fatness and performance differences between men and women. Research Quart. 50, 333-340, 1979.

10. Cureton K.J. and P.B. Sparling. Distance running performance and x metabolic responses to running in men and women with excess weight experimentally equated. Med.Sci.Sports exercise 12,2-94, 1980.

11. Dale E., D.H. Gerlach and A.L. Wilhite. Menstrual dysfunction in distance runners. Obstet. Gynecol 54,47-53,1979

12. Daniel S.M.,J.B. Critz and R.G. Knowlton. Cardiovascular, metabolic and ventilatory responses of women to equivalent cycle ergometer and tread mill exercise. Med. Sci. Sports, exercise 12, 14-19, 1980.

13. Davies C.T.: Thermoregulation during exercise in relation to sex and age. Eur. J. Appl. Physial. 42, 71-9, 1979.

14. Dill D.B., M.K. Yousef and J.D. Nelson. Responses of men and Women to two hour walks in desert heat. J. Appl. Physiol. 35, 231, 5, 1973.

15. Dill D.B., L.F. Scholy, D.C. McLean, T.F. Drost and M.T. Louchran. Capacity of young males and females for running in desert heat Med. Sci. Sports 9, 137-42, 1977.

16. Ericksson B.O., I. Engström, P. Karlberg, A. Lundin, B. Saltin and G. Thoren. Long-term effect of precious swimtraining in girls. A 10 year follow-up on the "girl swimmers". Acta Paediat. Scand. 67. 285-92, 1978.

17. Ferris E.J. The mythes surrounding women participation in sports and exercise. J. Sports Med. Phys. Fitness 19, 309-11, 1970.

18. Flint M.M., B.L. Drinkwater and S.M. Horwarth. Effects of training on women's response to submaximal exercise. Med. Sci. Sports. 6, 89-94, 1974.

19. Fortney S.M. and L.C. Senay Jr. Effect of training and heat acclimation on exercise responses of sedentary females. J. App. Physiol. 47, 978-84, 1979

20. Fox R.H. B.E. Lofstedt, P. Woodward, E. Ericksson, B. Wekstrom. Comparison of thermoregulatory function of men and women. J. Appl. Physiol. 26. 444-563, 1969.

21. Fraccaroli G.B., Physiological bases of female sports activities. Minerva Med 7 1. 1311-9 1980.

22. Haymes E.A. and A.L. Dickinson. Characteristics of elite male and female ski racers. Med. Sci. Sports exercise 12, 153-8 1980.

23. Hertic B.A. and F. Sargent. Acclimatization of women during work in hot environment. Fed. Proc. 22, 810-13, 1963.

24. Hong S.K. and H. Rahn. The diving women of Korea and Japan.Sci.Amer 216, 34-43, 1967.

25. Jordan D.B., J.J. Rhee, J.M. Kim, M. Low. Echocardiographic analysis of men and women marathon runners. Amer. College of sports medicine annual meeting, may 28-30, Las Vegas, p. 136.

26. .Kawata A Sex differences in sweating I.: Essential problems in climatic physiology. H. Yoshimura, K. Ogata and s. Itoh (Eds) Kyoto, Nankodo 1960, pp. 169-195 .

27. Kilbom A. Physical training in women Scand. J. Clin. Lab. Invest. 28, 1-34 Supp. 119, 1971.

28. Knowlton R.G. and H. Weber. A case study of training responses in a female endurance runner.J.Sports Med. Phy. Fitness 8, 228-235, 1968.

29. Laubach L.L. Muscular strength or women and men. A comparative study. AMRL-TR 75-32, Wright - Patterson Air Force Base, OH, Aerospace Med. Res. Lab. Aerospace Med. Div. Air Force Systems Command, 1976 (AD A 025793)

30.. Massicotte D.R. G. Avon, G. Corriviea. Comparative effects of aerobic training on men and women. J.Sports Med. Phy. fitness, 19, 23-32, 1979.

31. Nunneley S.A. Physiological responses of women to thermal stress, a review Med. Sci. Sports. 10, 250-255, 1978.

32. Paolone A.M., C.L. Wells and C.T. Kelly. Sexual variations in thermoregulation during heat stress. Aviat. Space Environ. Med. 49,715-19, 1978.

33. Powers J.A. Characteristics features of injuries in the knee in women. Clin. Orthp. 143, 120-124, 1979.

34. Schönholzer G., U. Weiss. R. Albonico. Biologic du sport, Birkhauser Verlag Basel, 1976 p. 189.

35. Weinman K.P., Z. Slabochova, E.M. Bernauer, T. Morimoto and F. Sargent. Reaction of men and women to repeated exposure to humid heat. J. Appl. Physiol. 22 533-38, 1967.

36. White G.M. and R.J. Young. Effect of twelve week exercise program on cardiorespiratory and body composition variables in non - obese young middle aged females. Brit. J. Sports Med. 12,27-32 1978.

37. Wilmore J.H. and C.H. Brown. Physiological profiles of women distance runners. Med. Sci. Sports 6, 178-181, 1974.

38.. Wintrobe M.M. Clinical Hematology, Philadelphia, Lea-Febiger, 1974.

39. Zaharieva E. Survey of sports women at the Tokyo Olympics. J. Sports. Med 5, 215-219, 1965.