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PHYSIHOLOGICAL DIFFERENCES

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Abstract: *To provide insight into the difference between males and females students from Naval Academy which impact on physical performance. While teachers must require equal efforts of male and females during the training period, they must also realize the women have physiological limitations which generally preclude equal performance. The present paper describes the most important physical and physiological differences between men and women.*
Key words : *performance capabilities, body size, strength, stress.*

TRAINING OBJECTIVE:
Identify the differences between males and females as they relate to physical activities.

1. INTRODUCTION

A. With the increased participation of women in most military jobs and activities, many questions have been raised regarding their health, safety and performance capabilities. Fitness leaders need answers to these questions when designed fitness program for coeducational groups. Are there structural or functional differences between the sexes which are truly unique in terms of performance?

B. Answers to many of these questions are being found now through research and observation of women in sport and physical activity.

C. There are some women who can perform as well as many men. There are also some men who cannot perform as well as many women. Although this overlap exists there may be some basic performance capabilities between genders that account for most of the differences we see. When general biologic differences are observed it is important to determine if these are basic differences or differences which exist because of the effect of training.

2. ABSOLUTE AND RELATIVE MEASURES

It is obvious that men throw farther, run faster, lift more and jump higher. We can measure exactly how much farther, faster or higher in terms of inches and seconds. This type of measurement is and "absolute" measure or what we can measure in the real world out on the playing field. A different type of measure is also very important to this discussion. That is the "relative" measure, or the rate of adaptation that becomes important when we examine actual differences between males and females. For example, we can measure how much weight a woman can list and how much weight a man can lift in absolute terms. We can also measure how much weight a woman can lift for her body weight compared to how much weight a man can lift for his body weight. Bigger people can usually lift more weight because they have more of what moves weight, that being muscle mass. So a "relative" comparison where we relate one measure to another important factor becomes even more meaningful in discussions such as this. Here is an example:

A man (200 lbs) and a woman (200 lbs) participate in a road march each is given their fair share of the load, 50 lbs. Fifty pounds is ½ of the female's body weight, whereas it is only ¼ of the man's weight. In this example 50 lbs is the absolute weight, the actual weight which must be carried represents a much greater weight if one relates it to the actual weight of the woman. Again bigger people tend to be stronger than smaller people, so it is an important factor if the road march is going to be successful. We could also relate the weight to be carried to the amounts of muscle mass that man has compared to the woman. The comparison is even more important. In any event, it is these "relative" differences which are important to this discussion.

3. PERFORMANCE RECORD DIFFERENCES

When we look at world record performances in track and field and swimming from 1963 through 1984 we can make the following observations:

A. Substantial gains both in absolute terms, and in relation to men's performance have been made by women over the last 25 years.

B. In general in relation to men, women perform best in swimming events and least well in jumping and throwing events that require a considerable degree of explosive power and strength.

C. Sexual differences in body composition may be an advantage to the female in swimming and a disadvantage in running

D. Performance record differences are undoubtedly affected by habitual activity levels so some of the data available is probably biased in this respect. Male and female opportunities to be active have not been equal.

4. ANATOMICAL DIFFERENCES

A. Females are shorter and lighter than males (30-40 lbs).

B. Females have lower center gravity.

C. Females have wider pelvis and femur slants inward creating a greater angle at the junction of the tibia and femur.

D. Females shoulders slope more and the angles of shoulders and arms are different.

RESULT: Some females may be prone to knee injuries because of the biomechanically inefficient joint. Females may differ from men in the use of tools, throwing and carrying rifles.

5. BODY COMPOSITION

A. Females have 10 to 15% more body fat than males
Typical male = 12 to 15% fat
Typical female = 22 to 27% fat

Higher levels of estrogenic hormones at adolescence are at least partially responsible for her higher fat percentage. Body fat varies with physical activity levels aw well as with sex and age. In weight bearing exercise the female must work against a greater work load because of the extra weight created by fat.

6. PSYHOLOGICAL DIFFERENCES

Physiologic differences are often due to factors such as body size and composition.

1. Women have smaller heart and heart volume (10 to 15%), decreased stroke volume and cardiac output.
2. During the same exercise females HR per minute is 5 to 8 beats faster than males.
3. Men have 6% more red blood cells and 10 to 15% more hemoglobin.
4. Women's max VO_2 is 20 to 30% lower than men's mostly due to more body fat and less muscle mass.
5. Habitual activity levels also affect max VO_2.
6. If max VO_2 is expressed relative to fat free weight (ml/kg/min) the sex differences in VO_2max is further reduced to approximately 15% and in some cases all but disappear.

B. Anaerobic Threshold Differences.

Anaerobic threshold designates the appearance of elevated blood lactate which is a product of anaerobic energy production. In exercise intensity is high enough to require an anaerobic energy contribution, then lactic acid will begin to accumulate. When lactate reaches a certain concentration in the blood fatigue will occur.

1. While exercising at the same absolute intensity (a unit run) females will tend to fatigue sooner because they will be working at the higher % of their VO_2 max than males.
2. If workloads are relative to aerobic power (everybody working at 70% of their max) females and males would fatigue at the same rate if all other factors are equal.

C. Women's need for iron

Iron deficiency is common among females who do regular endurance type exercise.

1. Females tend to lose large amounts of iron and red blood cells through menstruation.
2. Women especially need to eat iron-rich foods to maintain healthy levels of iron in the body (liver, red meat, beans, prunes, enriched bread).
3. Since women typically eat fewer calories, the iron requirement may not be met it those calories are not rich in iron.

D. Strength differences

Strength is directly related to the amount of muscle fibers recruited and the absolute size of muscle fibers recruited. Therefore, men are usually stronger than women because they have more muscle mass (20 to 40 lbs more muscle mass). In general women are who- thirds as strong as men.

a. Absolute strength differences

A 100 lb female bench pressed 80 lbs
A 160 lb male bench pressed 160 lbs
80/160 = a ratio of 5

Typically women have 50% of half the strength men have for the bench press activity.

b. strength based on body weight

A female 110 lbs bench presses 80 lbs which = 73% of her body weight

A male 160 lbs bench presses 160 lbs which = 100% of his body weight.

c. strength differences based on lean body mass (muscle)

A female has 22% fat = 86 lbs of LBM
She lifts 80 lbs which is 93% of her LBM
A male has 15% fat = 136 lbs
He lifts 80 lbs which is 1.18 of his LBM

Now the percent of what she can lift compared to his is 93/118 = 70%

E. Strength training

1. We do not see strength differences in children until ages 11-14. at puberty boys experience an increase in testosterone, the sex hormone know to stimulate muscle growth.
2. Males experience hypertrophy with extensive weight training programs. Females, on the other hand, substantially increased strength without muscular hypertrophy.
3. Therefore, increased in strength in females may be due to neural adaptations such as more recruitment or synchronization of motor units and reduced inhibition, as well as increased size.

F. Gender Differences in Heat Tolerance

1. Women sweat less than men under comparable conditions of heat stress which may explain why women tend to have higher core temperatures and higher heart rates than men while exercising.
2. The levels of physical fitness and acclimatization are very important when we compare men and women on their abilities to tolerate heat.
3. Females should be at no greater risk than males when exercising in the heat provided they are exercising at the same relative intensity (% of max VO_2). Following acclimatization both men and women increased heat rates and skin temperature.

G. Gynecological considerations

1. How does the menstrual cycle affect exercise performance?

There is no conclusive evidence to suggest that menstrual function affects physical performance. Women on the US Olympic teams over the last 25 years have won gold medals and established world records during all phases of the menstrual cycle. In spite of this there appear to be many individual differences in a female's ability to perform physical work before, during, and after menstruation. Performance is influenced by numerous physiological, psychological and environmental factors which probably have more affect than menstruation.

2. How does exercise affect menstruation?

Studies indicate that the majority of women who are physically active report no change in their menstrual function. Generally over 20% reported favorable changes and fewer than 12% in these studies reported menstrual disturbances.

3. Menstrual disorders associated with exercise and other forms of stress (basic training).

a. Dysmenorrhea – (painful menstruation) is a very common gynecological complaint. Symptoms include but are not limiter to cramping, backache, pains in upper things, nausea, dizziness and chills. The intensity of pain can range from mild discomfort to severe. Prostaglandins, hormone like substance produced by many tissues, are related to menstrual pain. Drugs which inhibit prostaglandin production seem to be effective in relieving pain associated with menstruation. A medical exam should rule out any organic, pathologic problems, then a physician may prescribe them for pain associated with menstruation a female may feel more like exercising if relieved of that type of pain. Exercise seems to relieve dysmenorrhea, consequently female soldiers should be encouraged to participate in physical training.

b. Amenorrehea – absence of menstruation for at least 3 consecutive month. Amenorrehea is common among endurance athletes, gymnasts and basic trainees. This condition is associated with many stress related factors, late onset of menstruation, diet, hormonal imbalances and physical, mental or emotional change. In most cases the normal menstrual cycle resumes once training is reduced or the stress is relieved. Amenorrehea students should report to sick call for an evaluation. Studies indicate that amenorreheic women are at more risk for serious bone loss.

CONCLUSION

Female students must sometimes be treated differently from males, women can reach high levels of physical performance. Teachers must use common sense to help both male and female students achieve acceptable levels of fitness. For example ability-group in games based difference between man and women. Unit run, however, do not.

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