Training Adam, Training Eve

Orr, Rob Marc

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Anatomical Variations

Musculoskeletal Structure

Although men and women have the same basic anatomical systems they have several gender specific differences. These differences are said to be the result of the cells of the body that are responsible for reproduction (Wells, 1991), as opposed to those dedicated to the individual's survival.

Height and Weight

On average men are 10 to 13 cm taller and 15 to 22 kg heavier than their female counter parts (Ebben & Jensen, 1998; Wilson, 1995; Wilmore & Costill, 1994; Fox, Bowers & Foss, 1993; McArdle, Katch & Katch, 1991; Wells, 1991).

Pelvis Width and Levers

In general females tend to have a wider relative pelvis when compared to males. This increase in pelvic width combined with shorter Femurs (through shorter stature) increases their Quadriceps Angle (Lee et al, 1996; Wells, 1991; Cavanagh, 1990; Totora & Anagnostakos, 1987). Combined with the relatively broader hips, women usually have narrower shoulders thus they are predisposed to an increased 'carrying angle'.

Male		*Female*
> 90*	**Pubic Arch**	**< 90 ***
Turned Inward	**Ischial Tuberosity**	**Turned Outward**
Small Heart Shaped	**Pelvic Inlet**	**Large and more Oval**
Long and Narrow	**Sacrum**	**Broad and Flat**
Heavy and Thick	**General Structure**	**Light and Thin**
Large	**Joint Surfaces**	**Small**

What this means?

A greater Q - angle in the average female means that when performing running based activities they require a greater pelvic displacement or shift to keep their centre of gravity over the foot during its stance (weight bearing) phase. Although this mechanical deficiency has been shown to have little effect on running speed (Fox, Bowers & Foss, 1993) it may increase the chance of injury. In fact research has shown that a Q - Angle of greater than 20* predisposes a person to injury. Now consider the effect of webbing, artificially increasing pelvic width to an even greater extent?

Centre of Gravity and Flexibility

The centre of gravity, which represents the balance point across three dimensions (Transverse plane, Sagittal plane and Frontal plane), is quoted at being between one percent to six percent (Seiler, 1995) lower in females. This difference is however dominantly due to the size of the individual more than their sex. Wells (1991) states that for the same standing height and somatotype, *'the difference in centre of gravity would probably be less than one inch.*'

In regards to flexibility, both the female athlete and the female in general, display a greater general flexibility than males (Australian Coaching Council,1991; Dortkamph, 1987).

Hormonal Differences

Males have up to 30 times more Testosterone than their female counterparts (Chu, 1996; Wilson, 1995; Baechle, 1994; Wilmore & Costill, 1994; McArdle, Katch & Katch, 1991). This hormone is responsible for protein synthesis (building muscle) and bone formation. It is due to a greater exposure of this hormone that males are taller, heavier and have a greater muscle mass.

Oestrogen, the female reproductive hormone, is primarily responsible for the storage of fat (Marieb, 1998; Wilmore & Costill, 1994) particularly in the hips and thighs (Wilmore & Costill, 1994). This predisposes women to have a three to six times higher fat mass (FM) (Ebben & Jensen, 1998; Wilmore & Costill, 1994; Fox, Bowers & Foss, 1993). The effects of this higher FM on a smaller frame is shown when the average total percent body fat is expressed, these being 13% to 16 % for males and 22 % to 26 % for females (Costa & Gutherie, 1994; McArdle, Katch & Katch, 1991; Wells, 1991).

What this means?

Thus not only is fat loss hormonally harder, but they are also disadvantaged in activities that require a rapid acceleration of the body (eg. jumping) as they have a lower lean body mass (LBM) (deVries & Housh, 1994). This decreased LBM and increased fat mass also has an effect on strength as will be discussed further.

Impact on strength

As determined, males have a greater average weight than their females. This heavier mass gives them a distinct advantage in the development of absolute strength and leads to Holloway's (1994) statement that woman have approximately two thirds the absolute strength and power than that of a man.

These differences vary between the upper and lower body as shown below. With this basic weight variation, it can be seen why females have only approximate 66 % the absolute strength (Wilson, 1995; Wilmore & Costill, 1994; Holloway; 1994; McArdle, Katch & Katch, 1991) than males.

	Ebben et al. (1998)	Wilson (1995)	Wilmore & Costill (1994)
Upper Body	40 - 60 %	60 %	43 - 63 %
Lower Body	25 - 30 %	30 %	25 – 30 %

The above authorities also agree that when expressed as relative strength the gap between the genders decreases rather rapidly and, in the comparisons of the lower body, may actually disappear (Ebben & Jensen, 1998; Wilson,1995; Holloway,1994; Wilmore & Costill,1994; McArdle, Katch & Katch,1991).

Cardio Respiratory Differences

Due to their smaller stature, women have a lower blood volume and smaller hearts (therefore smaller left ventricles). However cardiac output (Q) for the same absolute power output is generally the same in both sexes (Wilmore & Costill, 1994). With heart rate and stroke volume being the predominant determinants of Q, the virtual equality would mean that an increased heart rate in females is needed to compensate their smaller stroke volumes (Wilmore & Costill, 1994).

Being smaller of frame also predisposes the female to have a lower tidal and ventilatory volume. Combine this with a lower haemoglobin (Hb) content (10 to 15% less per 100ml of blood) (Costa & Gutherie, 1994; deVries & Housh, 1994; Fox, Bowers & Foss, 1993; McArdle, Katch & Katch, 1991; Wells, 1991) and the active muscles receive less oxygen, this in turn effects the metabolic systems (Wilmore & Costill, 1994).

METABOLIC VARIATIONS

VO_2 MAX

The average male VO_2 max is 15 % to 30 % higher than that of females (Wilmore & Costill, 1994; McArdle, Katch & Katch, 1991). Although absolute VO2max values are shown to be lower, VO_2 gains in men and woman are said to be the same (Wells, 1991).

Lactate Thresholds

Women tend to reach their lactate threshold sooner than men at the same absolute workload (Wilmore & Costill, 1994; Wells, 1991). This may be due to the higher oxidative capacity in men (due to <Hb) and would therefore rely less heavily on the anaerobic systems. When expressed in terms of percentage VO2max, however, lactate thresholds do not differ between the sexes (Wilmore & Costill, 1994; Wells, 1991).

What this means?

Working at a prefixed workload, eg running in files or as a group often means that a female soldier is working harder to maintain the same work output.

SOCIOLOGICAL VARIATIONS

Social Barriers

Even before the hormonal effects of puberty separate physical attributes, females tend to be left behind in the important skill development brought on by the numerous repetitions of movement patterns generated by playing.

At a young age society begins to effect the young man and lady. Girls are seen as ‘daddy’s little girl’ or ‘mummy’s helper’, with time outside restricted and playing inside with dolls preferable to running around outside with toy guns (Weinberg & Gould, 1995). Even the games played follow the stereotypical role of the male and female, the young lady playing the nurturing mother or parent, the young man with the gun playing the male hero. These roles are still enforced in many ways by our daily entertainment, be they movies,

television or even books. Primary school yards portray this social ideology every day with most girls sitting in small groups reading or talking and most boys tearing around on playground equipment or playing some form of game.

Conformity or Achievement

This segregation increases through puberty as the hormonal and social effects take hold. For many young teenage women their major concern becomes where they fit and their social standing as opposed to what they can achieve. Being in the 'in' crowd is more highly valued than coming first in a race. Kerr (1985, as cited by DeBoer 1998, p.56) calls this mentality the "*issues of conformity versus achievement.'*

For the female, particularly the teenager, conformity is the image of femininity. Anything which causes a women to contradict society's image of femininity is a threat to their social conformity. This is commonly shown on most television 'soap' series involving the young female teenager, they fear the dreaded PT or PE class with the hardnose female coach, their main premise becomes one of attracting boys, shopping and gossip.

Female or Athlete, one or the other

The traditional Victorian femininity traits include submissiveness, passivity, grace and beauty whilst competitive sport is seen as aggressiveness, toughness and achievement. This conception of female social standing means that any female who participates in active sports tends to be ostracised, with the sport they are playing and their level of success being two main factors as to how far they are outcast. For example, a female teenage athlete chosen to represent her state at rhythmic gymnastics would not receive as much negative rebuke as a similar athlete chosen to represent the state in Shot Putt. This is again enforced by the Feminist Majority Foundation (1995, p.1) who state that '*Female athletes in traditionally masculine sports challenge the social dictates about proper behaviour in females : therefore the reasoning goes, there must be something wrong with them*.'

Homophobia

'Homophobia', a fear of being labelled homosexual, caused by the discussed socially expected role of the female, effectively provides a major hurdle in the development of female athletes. The Feminist Majority Foundation explain almost 50% of the female coaches, athletes and administrators surveyed claimed that their involvement in sports had lead to the conception that they were lesbians (Feminist Majority Foundation,1995).

Media Coverage

In line with 'Homophobia', there are several cause and effect factors that continue to plague the female in sport. Firstly there is little coverage of the female athlete in comparison to the male athlete. In 1998, all Australian media attention was on the Australian men's basketball team, the 'Boomers' and their attempt to win a medal at the 1998 world championships. Even their seventh - eighth place play-off was widely televised. Oh and by the way, the Australian women's basketball team, the 'Opals', won a bronze medal, but few knew. It was reported by Jenny McAsey in the Weekend Australian newspaper that whilst ten Australian journalists went to Athens to cover the men's basketball championships, only two were sent to cover the women's (McAsey, 1998).

Even with the increased effort to cover female sporting activities, those chosen are more feminine in nature.

NBC obviously programmed its Olympic coverage to appeal to a predominantly female audience, but it centred on pretty sports like gymnastics, swimming and diving at the expense of the gritty sports like softball, soccer and basketball. (San Francisco Examiner, 1996)

By covering those sports that the produces and audience perceive as feminine they again reinforce the attitude that the harder sports are not feminine. As Costa and Gutherie (1995) state '*The under representation and misrepresentation of female athletes thus harms women's chances for equal opportunities in sports.'*

Funding & Salaries

This lower media coverage leads to less sponsorship which inturn means less sponsor funding. Less sponsor funding inevitably means lower salaries for those who would coach, and lower scholarships for athletes who would participate in, a low coverage activity. In 1991,

… *Although the numbers of men and women on campus were roughly equal, the NCAA found that men received 70% of scholarship money, 77% of operating budgets, and 83% of recruiting money*. (Feminist Majority Foundation 1995,p.2)

What this means?

This leads to the premise that males often have numerous years more 'experience' with physical activity, furthermore the methods utilised to instruct females needs to adapted so as to educate and possibly counter old sociological ideals.

Menstruation

Cycles

The ***ovarian cycle*** relates to the series of events associated with the development and maturation of a female ovum or reproductive egg. The ***menstrual*** or ***uterine*** (Marieb, 1998; Wilmore & Costill,1994) ***cycle*** is the cyclic discharge of blood, secretions, tissue and mucus from a mature uterus in the absence of pregnancy. It is the hormonal effects of oestrogen and proestrogen, produced during the ovarian cycle, that influence the menstrual cycle (Spence, 1990). Both of these cycles typically last for 28 Days.

Menstrual Disorders

Amenorrhoea

There are two basic categories of amenorrhoea. ***Primary amenorrhoea*** is the delay of menarche, (the onset of menstruation.) (ACSM, 1997; Costa & Gutherie, 1994; Wilmore & Costill,1994; Wells, 1991). Whereas ***secondary amenorrhoea*** is the absence of menstruation for females who have had previous menstrual cycles. ACSM, 1997; Costa & Gutherie, 1994; Wilmore & Costill,1994; Wells, 1991).

Oligomenorrhoea

These are irregular or inconsistent menstrual cycles of 39 to 90 days (Faulks, 1997; Costa & Gutherie, 1994; Wilmore & Costill ,1994; Wells, 1991).

Dysmenorrhoea

Dysmenorrhoea refers to painful menstruation (Marieb, 1998; Wells, 1991; Australian Coaching Council, 1990)

Effects of Exercise on Menstruation

Dysmenorrhoea

It is a common belief that sporting activity and exercise may have a positive effect on dysmenorrhoea (Fox, Bowers & Foss, 1993; Wells, 1991; ACC, 1990). However, it has also been shown that swimmers who train during menstruation are more likely to suffer dysmenorrhoea (Fox, Bowers & Foss, 1993; Wells, 1991).

Amenorrhoea

Exercise -induced or athletic amenorrhoea has been closely associated in sports that require either low body weight and fat (like gymnastics and ballet dancing), have a long duration of activity (like distance running), or have a high appearance component (like swimming and diving). Statistics show this clearly.

The most probable cause of amenorrhoea is low body fat stores which can be induced by a **poor diet** and / or a sudden increase in, or **continual, high intensity training** (Faulks, 1997; Costa & Gutherie, 1994; Fox, Bowers & Foss, 1993).

What this means?

Amenorrhoea has been linked as a key component of the *female athlete triad*, and has been linked to osteoporosis. Osteoporosis thus leads to a weakening of bone and the chance of injury increases exponentially. For females with little body fat, the combination of long arduous field sessions with a poor diet may increase the chance of amenorrhoea and as such, if this is to be sustained calcium supplementation is to be recommended in consultation with the RAP.

Performance During Menstruation

At present the effects of menstruation are still unclear. Of athletes surveyed, some claim a decrease in performance, some an increase and others no change (deVries & Housh, 1994; Wilmore & Costill, 1994; Fox, Bowers & Foss, 1993; Wells, 1991).

Studies on the metabolic effects of exercise during menses, at sub maximal and maximal levels, have shown no change in performance (deVries & Housh, 1994; Fox, Bowers & Foss, 1993). The studies of Jurkowski and coworkers (1981, as cited by deVries & Housh 1994,p.612) found no change in VO2max during the follicular and luteal phase of the ovarian cycle.

What this means?

Physical performance standards should not be expected to deteriorate during menstruation, unless suffering from dysmenorrhoea. This will however be subject to the principal of ‘individuality’

Participation During Menstruation

At present there is no indication that exercise during menstruation is harmful and as such menstruation should not be seen as a way 'out' of activity. Unless the female is suffering from dysmenorrhoea, in which case she should be informed to report to the RAP, she is capable of performing physical activity (Wells, 1991). The instructor must however be aware of the psychological effect of menstruation on the athlete and, if a positive approach to menses is to be developed, the instructor should ensure that the female athlete is allowed to attend to personal hygiene during a session, if she feels the need. The instructor must ensure that the soldier is in no way embarrassed, or this will have a negative effect on the soldier's attitude towards training during menstruation.

There is a common misconception that menstruating females need to be prevented from swimming, they do NOT (Fox, Bowers & Foss, 1993; Wells, 1991). For those who fear a decrease in pool hygiene, studies have shown that menstrual fluids have NO effect on the normal pool bacteria levels (Fox, Bowers & Foss, 1993; Wells, 1991). As Wells (1991,p 99) states, *'Menstrual and Vaginal fluids are 'cleaner' than nose, mouth, skin or anal secretions*.' There is also no evidence to suggest that there is an enhanced risk vaginal bacterial infections (Fox, Bowers & Foss, 1993; Wells, 1991).

With all this in mind however, most authorities agree that with these points in mind the overall decision of participation still belongs to the athlete / soldier.

What this means?

This means that menstruation should not be used as a means 'out' of activity, nor should instructors feel tentative about giving physical activity to a soldier currently menstruating. With this in mind, the instructors should be mindful of the needs of the soldier and if in doubt refer to the RAP.

Programming

Resistance Training Programming

For prescription purposes, the training variables (repetitions, sets, rest, etc) should be governed by goal and training history as opposed to gender (Ebben & Jensen, 1998; Chu et al, 1996; Holloway, 1994; Costa & Gutherie, 1994).

Anaerobic /Aerobic Conditioning

Although overall performance outputs by females are lower when compared to males the adaptation to training has been shown to be similar regardless of gender. Therefore in regards to programming Fox, Bowers and Foss (1993) acknowledge that *'..ample evidence exists to demonstrate that men and women respond to training programmes in a similar fashion. Therefore the same general approach to physiological conditioning can be used in planning programmes for men and women.'*

What this means to you

- Gender differences explain why there is a variation in the requirements of the BFA (as does age differentiation).
- Females are meant to have a higher fat percentage than males.
- Just because a female is not keeping up with the main group it does not mean that she is not trying. Keep perspective.
- Avoid reinforcing negative social ideals (Eg. 'You hit like a girl' or 'Are you going to let her beat you?').
- The menstrual cycle is a normal healthy bodily response and it should be treated as such (by both parties).

Conclusion

Even with an increasing awareness of 'social equity', there are still many perceived and hidden factors that effect the female soldier from a social point of view, particularly pre-enlistment. These factors need to be considered, along with the physiological differences, if you are to develop an understanding of the issues affecting the female soldier.

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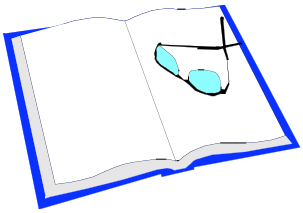

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