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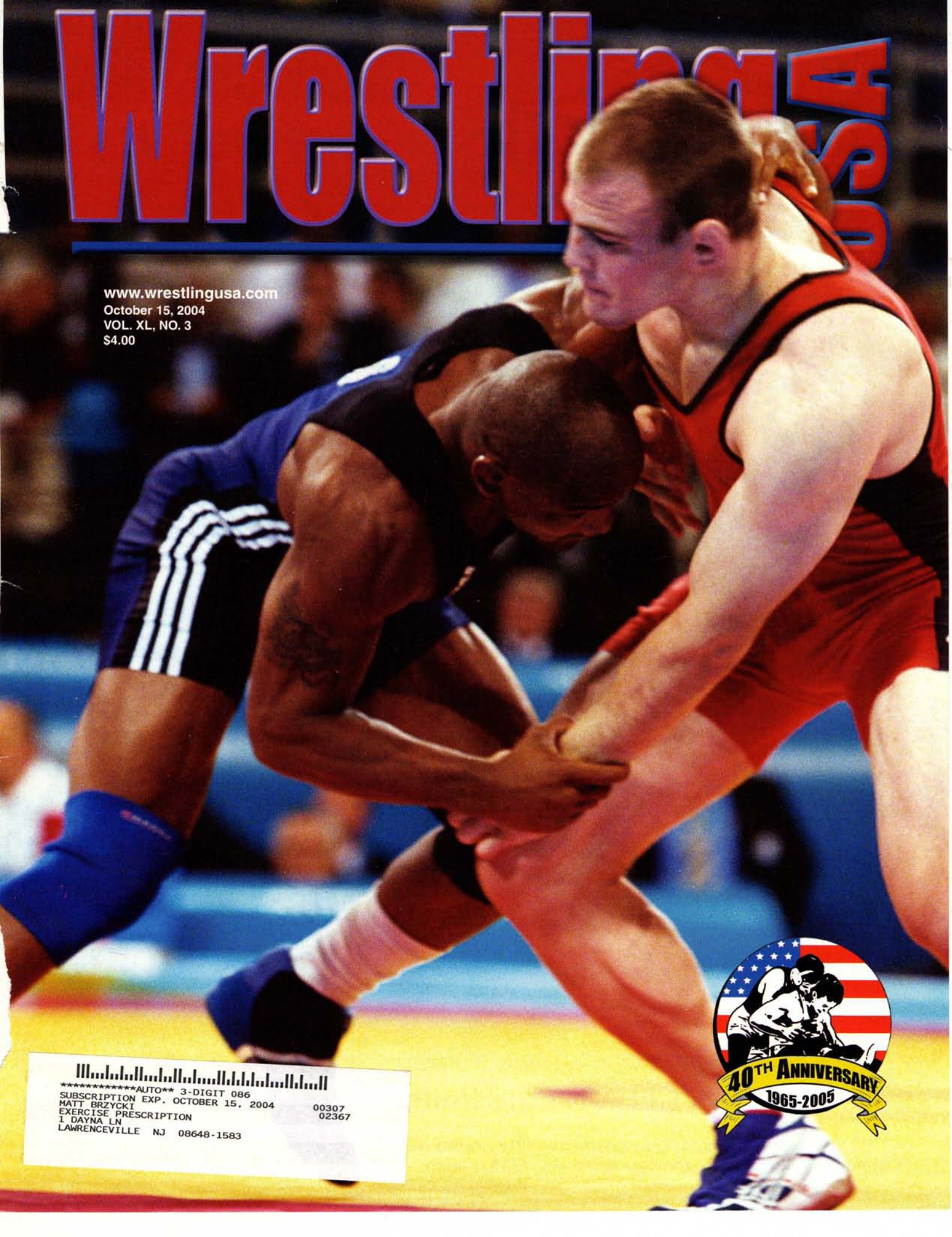
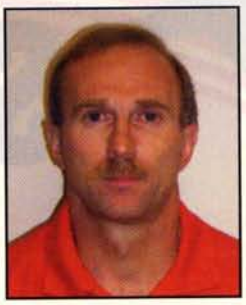


40TH ANNIVERSARY
1965-2005

WEIGHT TRAINING FOR WRESTLERS

Strength Training: Not Just for Males



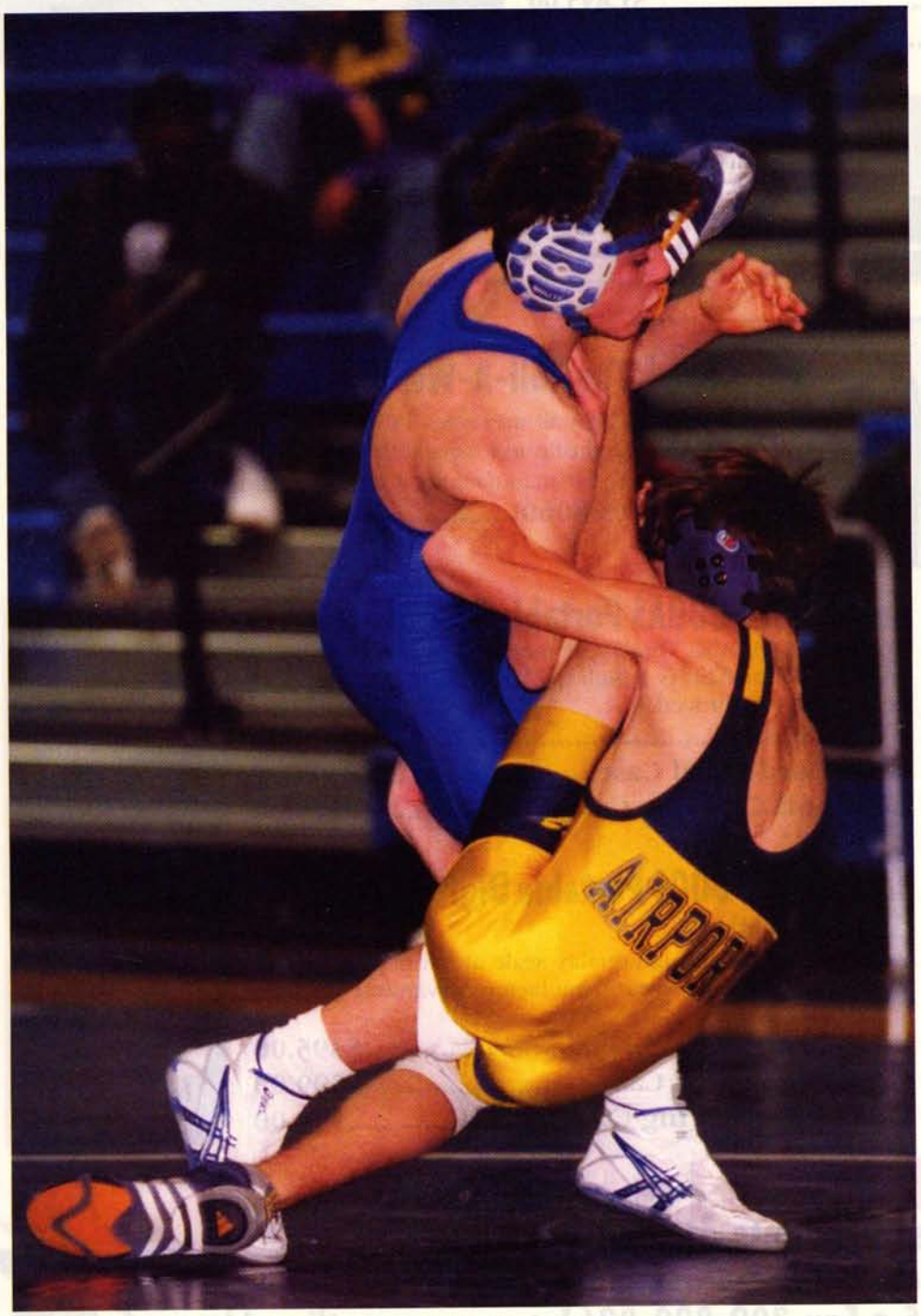
By Matt Brzycki

Largely due to the passage of Title IX in 1972, the number of females who participate in sports has grown by leaps and bounds. One of the sports that has been on the fast track for growth is wrestling.

Currently, thousands of girls wrestle at the scholastic level in the United States. A handful of states sponsor separate wrestling programs for girls along with some colleges and universities. Dozens of countries throughout the world have a national team, and, of course, women's wrestling was added as an Olympic sport and made its historic debut at the 2004 summer games in Athens.

With the rise in participation has come the burning need for sound information about preparation for wrestling. Other than skill training, perhaps the most important aspect of preparation is strength training.

Strength training is not just for males. The main reason why a female wrestler should do strength training is to reduce her risk of injury. By improving the strength of her muscles, connective tissues and bones so that those biological components can tolerate more stress, an athlete will reduce the likelihood of incurring an injury. Another reason why a female wrestler should do strength training is to improve the functional ability of her musculoskeletal system. By increasing her functional strength, an athlete will take an important step toward realizing her physical potential. This will also allow her to perform her skills on the mat with less effort. Furthermore, she will surrender less quickly to fatigue. Besides the physical and physiological benefits, strength training also provides various psychological benefits. This includes increased mental alertness as well as improved self-confidence and self-esteem.



DISPELLING THE MISCONCEPTIONS

It is hard to believe but it was not socially acceptable for females to lift weights until about the 1980s. Prior to that, many individuals worried that strength training would produce masculinizing effects. Gradually, most of these fears have subsided. But even to this day, some concerns continue to linger. The two biggest misconceptions about females who lift weights is that they will lose flexibility and develop large, unsightly muscles.

Michigan - Zac Donofrio (Dundee) scores a takedown to defeat Shea Hegedus (Airport) by a fall in 3:10 during a dual match. Photo by David Schankin.

Flexibility

Understand that a properly conducted strength-training program does not reduce flexibility. If anything, performing repetitions throughout a full range of motion against a resistance will maintain or even improve flexibility. Females who have residual fears about becoming less flexible can do a series of flexibility movements (or "stretches") both before and after their strength training. As an added measure, they can also stretch the muscles that were involved in an exercise immediately after it is completed. After doing the leg extension, for example, an athlete can stretch the muscles of her front thigh by doing a quad stretch.

Muscular Size

Increases in muscular strength are often accompanied by increases in muscular size. (The technical term for an increase in muscular size is "hypertrophy".) While this is true for males as well as females, the fact of the matter is that increases in muscular size are much less pronounced in females.

Since the early 1960s, studies have shown that most females can achieve significant gains in their muscular strength without concomitant gains in their muscular size. One researcher, for example, found that a group of 47 women increased their muscular strength in the leg press by nearly 30% after 10 weeks of training yet the largest increase in muscular size that was experienced by any of them was less than one-quarter inch.

Clearly, strength training does not produce excessive muscular size or masculinizing effects in the majority of females. There are several physiological reasons that prevent or minimize a female's potential to do so.

Muscle-To-Tendon Ratio

One of the factors that determines the capacity for muscular growth is the relationship or ratio between the length of a muscle and the length of its tendon. The potential for a muscle to increase in size is directly related to its length. Everything else being equal, individuals who have long muscles and short tendons have a greater potential for achieving muscular size than others who have short muscles and long tendons. Most females inherit relatively short muscle bellies coupled with long tendinous attachments. Therefore, relatively few females possess the capability for extreme muscular growth because they are genetically bound by an unfavorable and unchangeable ratio of muscle to tendon.

Testosterone Levels

Although it is a male sex hormone, testosterone is also in the blood of perfectly normal women. Testosterone stimulates skeletal growth as well as increases in muscle mass and strength. In short, its major action is to promote growth. Compared to males, most females have low levels of this hormone. In fact, the average female has a fraction of the testosterone that is found in the average male. The low levels of this growth-promoting hormone restrict the degree to which a female can increase her muscular size.

The small percentage of females who do develop relatively large muscles may have slightly higher levels of testosterone than the average female. In one study, researchers suggested that testosterone may play a role in a female's "trainability" (that is, the degree to which she responds to strength training). Another study that involved 10 women who participated in an intense strength-training program found that there was a high correlation between testosterone levels and muscular size.

Body Fat

A third physiological factor that prevents or minimizes the possibility that a female will significantly increase the size of her muscles is her percentage of body fat. Quite simply, females tend to inherit higher percentages of body fat than males. For example, the average 18 to 22 year old female has about 22 - 26% body fat, whereas the average male of similar age has about 12 - 16%. Having a higher percentage of body fat correlates to having a lower percentage of lean-body (or fat-free) mass. This extra body fat tends to soften or mask the effects of strength training. Females who have very little body fat appear more muscular than they actually are because their muscles are more visible. Also consider this: The appearance of muscle mass from strength training may not be the result of muscular growth. Instead, a decrease in body fat may simply make the same amount of muscle mass more noticeable.

Interestingly, the distribution of fat is gender-specific. Although there are individual differences, a male is predisposed to store fat in his mid-section and upper back; a female is predisposed to store fat in her hips and thighs. Moreover, the body type of the average female tends more toward endomorphy (fatness) while the body type of the average male tends more toward ectomorphy (leanness) and mesomorphy (muscularity).

Female Bodybuilders

If you are wondering about female bodybuilders, they have inherited a greater potential to increase the size of their muscles than the average woman (due to having favorable ratios of muscle to tendon, high levels of testosterone, low levels of body fat and so on). Highly competitive female bodybuilders have developed large muscles because of their genetic potential - not simply because they lifted weights. Also, it is well within the realm of possibility that female bodybuilders have used anabolic steroids or other pharmacological substances to enhance their muscular development.

Keep in mind, too, that female bodybuilders look much more muscular while posing on stage than they actually are in a relaxed state. While training for a competition, female bodybuilders have restricted their caloric intakes - often severely - thereby reducing their body fat and body fluids. Immediately prior to posing on stage, they have also "pumped" their muscles. This engorges their muscles with blood and makes them temporarily bigger - a condition known as "transient muscular hypertrophy." Finally, the stage lighting as well as their tans and clothing - and even the oil that is rubbed on their bodies - all contribute to making female bodybuilders appear as if they have much more muscular size than they really do.

There are a relatively small number of females who have inherited the ingredients that are necessary to experience significant increases in muscular size from lifting weights. But the overwhelming majority of females can gain considerable muscular strength from lifting weights yet have little change in their muscular size. In short, it is physiologically improbable for the average female to develop large muscles that are unsightly or unfeminine.

GENDER DIFFERENCES IN STRENGTH

Researchers have investigated gender differences in strength since the early 1900s. Strength differences between males and females are often examined from the standpoint of absolute strength - that is, purely how much weight that they can lift without considering any other factors. But it is also important to examine strength relative to bodyweight, body composition and muscular size.

Absolute Strength

In terms of absolute strength, the average male tends to be considerably stronger than the average female. An early review of the literature found that the absolute total-body strength of females was roughly 67% that of males. Since that time, numerous studies have compared the absolute strength levels of males and females and have reported varying degrees of differences. In general, however, research has consistently shown that males tend to be stronger than females in absolute terms.

It should be noted that the differences in absolute strength between males and females vary according to the areas of the body that are being compared. As an example, a review of nine studies revealed that, in comparison to males, the absolute lower-body and upper-body strength of females is about 57 - 86% (averaging 71.9%) and 35 - 79% (averaging 55.8%), respectively. The reason for this is probably related to the fact that both genders have had an equal opportunity to use their lower bodies to a similar degree (such as while standing, walking and running). But females have had less of an opportunity than males to use their upper bodies due to continued societal constraints. Another reason that has been cited is that males have wider shoulders than females, giving them a biomechanical advantage in upperbody strength.

Relative Strength

So in absolute terms, males are much stronger than females. However, males are significantly larger and heavier than females. In terms of absolute strength, the greater body size of males gives them a decided advantage over females. When assessing gender differences in strength, then, comparisons should be made relative to some measure of size. As noted earlier, the average female has more body fat than the average male. And there is a direct correlation between having a higher percentage of body fat and having a lower percentage of functional tissue (namely, lean-body mass). For instance, the average college-aged male who weighs 154 pounds with 14% body fat has 21.56 pounds of body fat and about 132.44 pounds of functional tissue [154 lbs x 14% = 21.56 lbs; 154 lbs - 21.56 lbs = 132.44 lbs]. On the other hand, the average college-aged female who weighs 121 pounds with 24% body fat has 29.04 pounds of body fat and 91.96 pounds of functional tissue [121 lbs x 24% = 29.04 lbs; 121 lbs - 29.04 lbs = 91.96 lbs]. So in this illustration, the average college-aged male has 27.27% more bodyweight [154 lbs compared to 121 lbs] and 44.02% more functional tissue [132.44 lbs compared to 91.96 lbs] than the average college-aged female. Clearly, strength must be expressed relative to bodyweight and/or body composition in order to be a better indicator of the strength differences between males and females.

Bodyweight and Body Composition

When the disparities in bodyweight and body composition are taken into consideration, the strength differences between males and females are less substantial. One researcher investigated the differences in the response to strength training of 26 men and 47 women who used identical testing and training programs. (To minimize the learning effect, at least four sessions were completed prior to the initial strength tests.) When expressed relative to bodyweight, the leg strength of females was nearly identical to that of males. And when expressed relative to lean-body mass, the leg strength of females was actually slightly higher than males. (In this study, the upperbody measures for men were significantly greater than they were for women regardless of how the values were compared.) Another researcher reported that women's upper-body strength measurements averaged 60 - 70% of men's relative to bodyweight and 80 - 90% of men's relative to lean-body mass. In a study involving 55 women and 48 men, the researchers concluded that the gender differences in strength are a function of lean-body mass and body composition. In short, making comparisons relative to body composition essentially eliminates any gender difference in strength.

With respect to gender differences in strength relative to bodyweight, it is also interesting to examine the performances of highly experienced athletes. This can be done easily by looking at the performances of elite powerlifters. Their accomplishments are a measure of strength - essentially one-repetition maximums - and they compete in different weight classes. Of course, the calculations are not totally precise since someone who "makes weight" in the 60-kilogram class, for example, will likely weigh somewhat more or less than this when actually competing. Nonetheless, it is still a convenient way to obtain a rough estimate of the gender differences in strength relative to bodyweight. In powerlifting, males and females compete in three different lifts (the squat, bench press and deadlift) in seven mutual weight classes (52.0, 56.0, 60.0, 67.5, 75.0, 82.5 and 90.0 kilograms). The forthcoming data were gleaned from the world records of men and women that were officially recognized by the International Powerlifting Federation as of June 2004 (in the seven mutual weight classes). Relative to bodyweight, performances by women in the squat and deadlift ranged from 67-77% (averaging 72.1%) and

70 - 78% (averaging 74.7%) of their male counterparts, respectively, compared to the reported range of 57 - 86% (averaging 71.9%) for gender differences in absolute lower-body strength. And relative to bodyweight, performances by women in the bench press ranged from 63 - 79% (averaging 70.4%) of men compared to the reported range of 35 - 79% (averaging 55.8%) for gender differences in absolute upper-body strength. So again, it is clear that the strength differences between males and females are less significant when bodyweight is considered.

Muscular Size

Strength is directly related to muscular size (that is, the cross-sectional area of a muscle). As an example, one study examined the strength per unit of cross-sectional area of muscle tissue of 18 physical education students (7 females and 11 males) and 5 male bodybuilders. The researchers found no significant differences between males and females when strength was expressed in relation to muscle cross-sectional area. Therefore, the differences in strength between males and females appear to be in the volume of muscle fibers not in the makeup of muscle fibers. In other words, gender strength differences are quantitative rather than qualitative. This means that although males usually have larger muscles than females, the force exerted by equal-sized muscles is the same in both genders. This is not surprising since muscle tissue is essentially the same regardless of gender.

To summarize: Females inherit less muscle mass than males and are, therefore, generally weaker with regard to absolute strength. But the qualitative ability of muscle fibers to generate force is independent of gender.

THE LAST REP

Here is something else to ponder: Despite the fact that the average male is stronger than the average female in terms of absolute strength, many females are much stronger than the average male. A number of women, for instance, have lifted more than 3 - times their bodyweight in the squat and deadlift - with one woman having squatted more than four times her bodyweight and another woman having deadlifted close to four times her bodyweight. And many women have exceeded twice their bodyweight in the bench press - with at least one woman having bench pressed nearly 400 pounds. Needless to say, the vast majority of the male population has not been able to attain these performances in those three exercises.

Females can make substantial gains in strength by lifting weights without fear of losing flexibility or developing a masculine physique. It is important to understand, however, that there is no need for gender-specific strength training. Even with the use of a high-powered microscope, it is literally impossible for a scientist to differentiate between the muscle tissue of females and the muscle tissue of males. So in general, female wrestlers can utilize the same strength-training program as male wrestlers.

Editor Note: Matt Brzycki has authored, co-authored or edited 11 books on strength and fitness including: Wrestling Strength: The Competitive Edge, Wrestling Strength: Prepare to Win and Wrestling Strength: Dare to Excel. The three wrestling books are available at all major bookstores or through Cardinal Publishers Group (800-296-0481).