

GENDER DIFFERENCES IN STRENGTH: A COMPARISON OF MALE AND FEMALE WORLD-RECORD PERFORMANCES IN POWERLIFTING

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INTRODUCTION

The comparison of strength performances between men and women has been under investigation for more than a century. In terms of absolute strength – that is, without regard for body size, weight or composition – the average man tends to be considerably stronger than the average woman. Specifically, the absolute total-body strength of women has been reported as being roughly 67% that of men. Further, the gender differences in absolute strength vary according to the areas of the body that are being compared. As an example, a review of nine studies by Laubach (1976) revealed that, in comparison to men, the absolute lower-body and upper-body strength of women is about 57 - 86% (averaging 71.9%) and 35 - 79% (averaging 55.8%), respectively.

So in absolute terms, men are much stronger than women. However, men are significantly larger and heavier than women. In terms of absolute strength, the greater body size of men gives them a decided advantage over women. When assessing gender differences in strength, then, it is important to make comparisons relative to body weight and/or composition. When these disparities are taken into consideration, the strength differences between men and women are less appreciable. Bishop (1983), for instance, reported that the upper-body strength of women averaged 60 - 70% that of men relative to body weight.

The purpose of this investigation is to examine the gender differences in strength by comparing world-record performances in powerlifting. In brief, three different lifts are contested in powerlifting competition: the squat, bench press and deadlift. These three movements involve the major muscles in the lower and upper body which is handy

for making comparisons to established and accepted data. Moreover, the lifters compete in a number of designated weight classes which is convenient for obtaining a rough estimate of strength relative to body weight.

METHODS

Data for world-record performances by male and female powerlifters were collected and analyzed. The world records were those officially recognized by the International Powerlifting Federation as of February 2001. (Records that were pending were not considered.) Performances by men and women in the three competitive lifts were compared in seven mutual weight classes: 52, 56, 60, 67.5, 75, 82.5 and 90 kilograms.

In each of the seven weight classes, the world-record performance of the woman was divided by the world-record performance of the man. Thus, the resulting number is a percentage of male strength.

RESULTS

The major muscles used in the squat are the buttocks, hamstrings, quadriceps and lower back. Figure 1 shows that the world-record performances by women in the squat ranged from 65.766 - 76.984% of their male counterparts.

The chest, shoulders and triceps are the major muscles used in the bench press. Figure 2 reveals that the world-record performances by women in the bench press ranged from 60.563 - 70.667% of their male counterparts. Interestingly, this is virtually identical to the values previously reported by Bishop (1983) when comparing the upper-body strength of women to men relative to body weight (60 - 70%).

The major muscles used in the deadlift are the buttocks, hamstrings, quadriceps and lower back. Figure 3 shows that the world-record performances by women in the deadlift ranged from 69.032 – 78.519% of their male counterparts.

DISCUSSION

Various anatomical and physiological attributes of women have been mentioned as contributing factors in gender strength differences including narrower shoulders and higher percentages of slow-twitch fibers (which produce lower amounts of force than fast-twitch fibers). Regardless of the reasons, the average man is much stronger than the average woman in terms of absolute strength. These gender differences in strength become less significant, however, when making comparisons relative to body weight and/or composition.

Though not investigated, making comparisons relative to body composition essentially eliminates any gender difference in strength. Consider the fact that females tend to inherit higher percentages of body fat than do males. In particular, the average 18- to 22-year-old woman has about 22 – 26% body fat, whereas the average man of similar age has about 12 – 16%. Having a higher percentage of body fat correlates to a lower percentage of functional tissue, namely lean-body (or fat-free) mass. For instance, the average college-age man who weighs 154 pounds with 14% body fat has 21.56 pounds of body fat and about 132.44 pounds of functional tissue [154 pounds x 14% = 21.56 pounds; 154 pounds - 21.56 pounds = 132.44 pounds]. On the other hand, the average college-age woman who weighs 121 pounds with 24% body fat has 29.04 pounds of body fat and 91.96 pounds of functional tissue [121 pounds x 24% = 29.04 pounds; 121 pounds - 29.04 pounds = 91.96 pounds]. So in this illustration, the average college-age man has 27.27% more body weight [154 pounds compared to 121 pounds] and 44.02% more lean-body mass [132.44 pounds compared to 91.96 pounds] than the average college-age woman.

The fact of the matter is that strength is directly related to muscle size – that is, the cross-sectional area of the muscle. As an example, a study by Schantz and others (1983) 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 men and women when strength was expressed in relation to muscle cross-sectional area. Therefore, the differences in strength between men and women appear to be in the volume of muscle fibers not in the makeup of individual fibers. In other words, gender strength differences are quantitative rather than qualitative. This means that although men usually have larger muscles than women, the force exerted by equal-sized muscles is the same in both genders. This isn't surprising since muscle tissue is essentially the same regardless of gender.

Despite the fact that the average man is stronger than the average woman in terms of absolute strength, many women are much stronger than the average man. A number of women, for instance, have lifted more than 3½ times their body weight in the squat and the deadlift – with one woman having deadlifted nearly four times her body weight. And more than a few women have exceeded twice their body weight in the bench press. The vast majority of the male population has not been able to attain these performances in the three powerlifts.

CONCLUSION

This examination of male and female world-record performances in powerlifting found that the gender differences in strength are not as significant when body weight is taken into consideration. In relation to body weight, the world-record performances by women in the squat and the deadlift ranged from 65.766 – 76.984% and 69.032 – 78.519% of their male counterparts, respectively, compared to the reported range of 60 – 80% for gender differences in absolute lower-body strength. And based upon body weight, the world-record performances by women in the

bench press ranged from 60.563 – 70.667% of men compared to the reported range of 35 - 79% for gender differences in absolute upper-body strength.

All told, this investigation examined 21 world records by men and women (three lifts in seven weight classes). Of the 21 world-record performances by men, 11 (52.38%) have been set since July 1993. Incredibly, of the 21 world-record performances by men, 7 (33.33%) have been on the books since October 1982. Of the 21 world-record performances by women, 19 (90.48%) have been set since July 1993. (The other two were established in 1984.) In fact, 14 of the 21 (66.67%) world records by women have been established since June 1997. This suggests that women have not reached their performance potential in the three powerlifts and are closing the gap in gender differences in strength.

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SQUAT

WEIGHT CLASS	FEMALE	MALE	% OF MALE
52.0	182.5	277.5	65.766
56.0	191.5	287.5	66.609
60.0	220.0	320.0	68.750
67.5	242.5	315.0	76.984
75.0	246.0	328.0	75.000
82.5	252.5	379.5	66.535
90.0	260.0	375.0	69.333

Figure 1: Comparison of female and male world-record performances in the squat. (Weights are in kilograms.)

BENCH PRESS

WEIGHT CLASS	FEMALE	MALE	% OF MALE
52.0	107.5	177.5	60.563
56.0	132.5	187.5	70.667
60.0	120.0	186.5	64.343
67.5	142.5	203.0	70.197
75.0	148.0	218.0	67.890
82.5	151.0	240.0	62.917
90.0	163.0	255.0	63.922

Figure 2: Comparison of female and male world-record performances in the bench press. (Weights are in kilograms.)

DEADLIFT

WEIGHT CLASS	FEMALE	MALE	% OF MALE
52.0	197.5	256.0	77.148
56.0	222.5	289.5	76.857
60.0	214.0	310.0	69.032
67.5	244.0	316.5	77.093
75.0	265.0	337.5	78.519
82.5	257.5	357.5	72.028
90.0	260.0	372.5	69.799

Figure 3: Comparison of female and male world-record performances in the deadlift. (Weights are in kilograms.)