STRENGTH OF WOMEN

CLELIA D. MOSHER, M.D.

War is over and a world is to be reconstructed. In these stirring days we are casting aside as handicaps our old prejudices, beliefs, traditions, weighing all things in the balance, testing habits and influences, with purposes mighty and far reaching, the work of women was never more vital, more basic. Not only does the world acknowledge her individuality and its claim to consideration, not only is her economic value clearly a factor to be reckoned with, but over and above all is the supreme necessity for her racial efficiency. The old idea that motherhood was incompatible with self expression, that in yielding to the demands of marriage a woman renounced her individuality, has given place to the larger conception that she who is best prepared physically, mentally, ideally, for the duties of home is also prepared for all her obligations as an individual, as a citizen and as a member of the industrial and social order.

In this transition period, too often, the woman is not playing fair. She is holding on with both hands to the privileges granted to her because of her weakness and dependence, and at the same time is demanding the freedom of equality, sometimes, however, with lack of vision, the new freedom has entailed no new idea of a wider, more perfect filling of her own great place in the world, but has led only to a servile imitation of the man—an attempt to make herself into what Mr. Walter Lippmann has characterized as an "amateur male." [1] The time has come for us to build a new conception of woman and her possibilities. This new conception, we shall find, in no way denies the great task eternally imposed upon her by nature—the great task of bearing and rearing sound children. On the contrary, a true realization of herself

[1] Lippmann, Walter, "Drift and Mastery," New York; Henry Holt & Co., 1917; p. 221.

will make her more efficient here as in all other fields. There is no antagonism between her duty to the race and her own development. The fetish to which we all to a greater or less degree bow down, consciously or unconsciously, is that all differences of sex are inherent. Men and women are really more alike than unalike; many of the differences, actual as well as apparent, are the artificial product of habit and education based on over-emphasis of preconceived differences. We have been so engaged in the contemplation of these differences as a result that we have failed to go back to them as a cause; so blinded by the pre-judgments of traditional thinking that we have too often neglected to apply the scientific method which would discover whether these apparent unlikenesses are inherent or removable. The fact is, woman has done her specialized work in the world less well because hampered by this false psychology; and not only she, but the race also, has suffered from a false conception of her weakness and lack of endurance. We may profitably consider for a moment this old idea of sex difference and its influence.

We translate life constantly into terms of sex. The new baby has its layette prepared, pink for the boy and blue for the girl. We begin to make the difference at birth and continue it through every period of the woman's life.

The little girl of my generation, hearing constantly, "You must not do this. You must not do that. It is not lady-like," had this bogey overshadowing her childhood, curbing her normal impulse toward physical activity. She was provided with a doll and expected to sit quietly playing house; and if her muscles demanded activity, if her restless spirit voiced her feelings by shouting, if she ran and played ball with her brother, she was designated a tomboy. Have we not right here the beginning of her muscular weakness? Limit the activity of the little boy in the same way, and the product would be equally weak.

As Miss Woodbridge[2] points out, "even the nursery rhymes carry out the ancient tradition:"

"Clap hands, clap hands, 'till Father comes home,
For Father has money but Mother has none.

Oh, dear, what can the matter be,
Johnny's so long at the fair?
He promised to bring me a bunch of blue ribbons
To tie up my bonny brown hair.

Curly locks, curly locks, will you be mine?
You shall not wash dishes nor yet feed the swine,
But sit by the fire and sew a fine seam,
And feed upon strawberries, sugar and cream."

Miss Woodbridge goes on:

"When we see the girl crooning over her doll, we call attention to the natural mother, while the 'natural father' latent in the little boy beside her has never been called out." Have we not here one of the reasons for the small family? Not infrequently it is the man, not the woman who objects to children.

Dr. Lilian Welsh and Dr. Mary Sherwood[3] quote Dr. Playfair as follows: "Up to the time of puberty there is comparatively little difference between the sexes in health, in disease or in any other condition. Conventionally they are separated, and different modes of education and training will soon make such differences as there are more marked, but boys and girls play together and are on a footing of perfect equality, there being little essential which distinguishes one sex from the other."

We have gone somewhat beyond the following ideals since 1904, when Dr. Sherwood and Dr. Welsh wrote:

"As education progresses the boy is trained with the idea that he is to be the head of a family, to bear civic responsibility, to assist in guiding national affairs, to be economically independent. The girl is trained to directly opposite notions; she is expected to be helpless and dependent, and this is undoubtedly a distinct, hygienic disadvantage."

[2] Woodbridge, Elizabeth, "The Unknown Quantity in the Woman Movement," *Atlantic Monthly*, Apr., 1914; pp. 510-520.

[3] Welsh, Dr. Lilian, and Sherwood, Dr. Mary, in Dr. Howard Kelly's "Medical Gynecology," p. 52; Appleton & Co., New York, 1904.

The modern world, perhaps, shows greater realization of this real lack of difference in boys and girls, but this "habit of expectancy," to use Miss Woodbridge's highly expressive phrase, unconsciously influences our thoughts.

Even to-day if a woman has not rolls of fat over her hips put there by her inactivity, she is told that she has a boyish figure, even though her broad pelvis fulfills every measure assuring an ample birth canal. If she has well developed abdominal muscles, so essential to painless menstruation and vital to the normal support of the abdominal organs, she is characterized as having the abdomen of a man.

I leave my garden where I have been spading all morning but, attired again in my conventional garb mentally as well as physically, I realize, with amusement, how unconsciously I am thinking, as I pass my neighbor who still has her spade in her hand, "What an unsuitable occupation for a woman!"

This preconceived notion of what a woman should be and do makes even the scientist occasionally blind to clear observation of what woman is and does. Professor Sedgwick,[4] the able biologist, forgets all scientific methods and discusses votes for women with heat and an inaccuracy which calls forth a storm of protest from equally able scientists with a broader point of view.

Where the woman problem is concerned, it is rare to find a man able to discuss any phase of it with coolness and on an impersonal basis. His knowledge of women is usually confined to a small group—wife, daughters, sisters, mother; what they are, how they react to a given question, obscures the larger view.

The truth is, as we are beginning to realize, that the world is divided into males, females and human beings. The third group which is rapidly increasing in numbers is composed of men and women no less sexually perfect, but who put sex, important as it is, in its proper relation to life. They neither obtrude offensively their

[4] Sedgwick, Prof. William T. Interview in *N. Y. Sunday Times*, Jan. 8, 1914. Also replies by Dr. Simon Flexner, Dr. Frederick Peterson, Dr. W. H. Howell, Dr. Franklin Mall and others in *N. Y. Times*, Feb. 15, 1914.

femaleness or maleness by immodesty in dress, if they are women, nor, if they are men, give offense by their manners and habits.

Fundamental and vital as sex is, it is not a limitation; woman's efficiency, individually, economically and racially, has been tremendously lessened by this over-emphasis and at enormous cost to the life of the world. Although I profoundly believe in the full importance of woman's work as wife and mother, yet this belief does not in the least degree connote sex limitations. On the contrary, the study of the muscular strength of college women, which Dr. Martin and the speaker[5] have made, shows that there is no difference in the muscular strength of women and men which is due to sex as such. The differences which are frequently found are due to differences in the use of the muscles, brought about by conventional limitations of activity or dress. It would naturally follow, then, that a woman who has had a normal development should be able to do any work that a man of the same size and weight may profitably do. Our study also clearly demonstrated that a high degree of muscular power in the woman in no way lessened her racial efficiency and that the lack of muscular power, as in the pectoral muscles as I shall show you later, is a distinct racial disability. From this it would follow that, while there may be no physical reason why women who are physically fit should not have much the same activities as the men, the fact remains that at the present time these will not always best promote the well-being of women under existing conditions. Too often a great majority in any group of women have had these conventional limitations of activity and dress operative over so long a period that not only are there physical, but mental changes as well.

The importance of dress in relation to woman's strength, efficiency and endurance is appallingly great. That it cannot be ignored is obvious. Nowhere in the whole range of hygiene has traditional thinking operated to such an extent to the detriment of the woman as in this one subject of dress and fashion.

[5] Mosher, Clelia Duel, and Martin, Ernest Gale, "The Muscular Strength of College Women." *Journal Am. Med. Assoc.*, Jan. 19, 1918.

While the fashions of to-day favor hygienic clothing and a normal-sized waist and no longer is the delicate, undeveloped woman the type of beauty, yet to prove the close connection between an idea and its product we have only to look at the lady of the mid-Victorian period who made a virtue of necessity. Amy Louise Reed[6] in "Female Delicacy in the Sixties," quotes Cornelius O'Dowd in *Blackwood's* for April, 1865:

"Who gladly accepts the hoop and sweeping skirts as an admission that they are very women after all, unfitted by nature and constitution to move easily or to feel in their place in the bustle of crowds and the stir of active out-of-door life."

What would he say to the efficient, untrammeled woman worker of the great war? Again to quote Miss Reed:

"'Is a small waist admired by gentlemen?' cries one enthusiast in the *Queen*. 'I believe there is not one young man in a thousand who does not admire the graceful slenderness of the waist.' Another lady writes to the same magazine to ask, 'What is the smallest sized waist that one can have? Mine is sixteen and a half inches!'"

Much water has gone under the bridge since those days of feminine delicacy. The world war has shaken us out of some of our conservatism. For more than a year hundreds of American women wore some sort of uniform. Rich and poor alike wore the same uniforms, making for the obliteration of lines of class in a democratic people. Distinction more often rested, in consequence, on ability than on the influence of sex. But whether you liked or disliked the uniform dress, the fact remained that the women were one hundred per cent. efficient; thus, war has again demonstrated that the ordinary dress of women, attractive or unattractive, does not make for health or endurance.

Unhygienic clothing has brought about far-reaching results. These have been studied by many observers and in various ways. Let us consider for a moment the effects on the type of respiration. In 1892 when the speaker

[6] Reed, Amy Louise, "Female Delicacy in the Sixties." *Century Magazine*, Oct., 1915, pp. 855-864.

began her study of the physiology of women, every physiology taught that woman breathed costally and men abdominally and went on to say that the difference in type of respiration was a provision against the time of gestation—in other words, for the time when the gravid uterus would interfere with the descent of the diaphragm.

In 1894 the writer[7], while at Stanford University, and Dr. Fitz[8] at Harvard, independently and almost simultaneously, demonstrated that there was no sexual difference in the type of respiration. In arriving at this conclusion the writer studied some eighty-four women and children and five men. The costal type of respiration so frequently found at that time was due to the compression of clothing. A further study[9] of fifteen pregnant girls in a rescue home and serial observations, made month after month on a pregnant woman, made possible the demonstration that pregnancy does not require a special type of respiration for the woman; while the respiratory movements tend to become equalized in the three regions, the diaphragmatic respiration persists as late as the eighth month and even the beginning of the ninth month of pregnancy.

In addition, the undesirability of the costal type of respiration is further shown by these additional facts: the movements of the diaphragm materially aid the expulsion of the bile from the common duct, as has been proved by Heidenhain and his pupils according to Naunyn. We may here have one of the factors in the production of gallstones, which are of more frequent occurrence in woman that in man, another undesirable result of the unnecessary costal type of respiration. Although greater numbers of women to-day breathe diaphragmatically, there are far too many women who have not yet learned that the development and use of the ab-

[7] Mosher, Clelia Duel, "Respiration in Women." Preliminary report as thesis for M.A. Degree, Stanford University, May, 1894. Also paper presented at California Science Association, Jan. 3, 1896.

[8] Fitz, G. W., "A Study of Types of Respiratory Movements." *Journal of Experimental Med.*, Vol. I, No. 4, 1896.

[9] Mosher, Clelia Duel, "The Frequency of Gallstones in the United States." (Read before the Johns Hopkins Hospital Medical Society, March 4, 1901). *The Johns Hopkins Hospital* Bulletin, Vol. XII, No. 125, August, 1901.

dominal muscles are vital to the health and strength of women.

As Mrs. Hale has suggested, history tells us that the skirt was originally a man's garment. And it does still, among some modern nations, belong to the uniform of the warrior. We not infrequently saw on the streets of Paris a soldier wearing his full short skirt of white. Besides these eastern men with their swarthy faces, their fierce moustachios, gay coats, there were also, the "Ladies from Hell," with their short pleated skirts of tartan. No one would associate weakness, incapacity or effeminacy with these men, who wore without loss of caste what we have grown to regard as the badge of womanhood. The skirt, however, as modified by the vagaries of fashion, has a direct bearing on the health, development and efficiency of the woman. This we shall now consider. In our study of the muscular strength of college women, the most striking difference between the strength of men and women was found in the hip and knee extensions and flexions, as shown in Table I.

* TABLE I.—PERCENTAGES IN HIP AND KNEE EXTENSIONS AND FLEXIONS

	Hip Extension Per Cent.	Hip Flexion Per Cent.	Knee Extension Per Cent.	Knee Flexion Per Cent.
Men	3.70	3.20	3.30	1.75
Women	3.42	2.69	3.175	1.30

The limitation of movement due to the conventional skirt and the consequent limitation of activity will probably fully account for the difference.

In 1893-96 I made a series of observations on the clothing of ninety-eight young women. The average width of skirt was then 13.5 feet—the widest 15 and the narrowest 9 feet. The weight of the skirt alone was often as much as the entire weight of the clothing worn by the modern girl. In 1917, in the study of the muscular strength of forty-eight college women, I had an opportunity to observe again two of the women of this earlier group—one was then fifty-three years old (No. 37) and the other, forty-five years old. Neither had worn a corset; both had been physically active and had worn their skirts

* From "The Muscular Strength of College Women with Some Consideration of its Distribution," by Mosher, Clelia D., and Martin, E. G., in *Journ. Am. Med. Assoc.*, Jan. 19, 1918.

supported. Both of these older women, who had been great bicycle riders when in college, showed unusual power in the muscles concerned in hip and knee extension. The older one, who sometimes rode her wheel as much as three thousand miles in a year, exceeded in percentage distribution even the percentage of the greatest men athletes. But it is interesting to note that both of these women, on the other hand, showed greater weakness in the flexors of the hip and the flexors of the knee than even the average of the younger women whom we examined and whose power in the extensors of the hip and the extensors of the knee were so much less. It is with the flexor muscles that the skirt interferes.

* TABLE 2.—PERCENTAGES IN A COMPARATIVE STUDY OF HIP AND KNEE FLEXIONS AND EXTENSIONS

	Hip Extension Per Cent.	Hip Flexion Per Cent.	Knee Extension Per Cent.	Knee Flexion Per cent.
Case 37 (age 53 3/12 years).....	3.93	2.425	3.61	1.195
Average percentage athletic men.....	3.70	3.20	3.30	1.75
Average percentage women.....	3.42	2.69	3.175	1.30

These older women had had their muscular activity interfered with by the skirt over a great many years, while the modern young women, not only had been hampered for a much shorter period of time, but the interference with these muscles had been much less by reason of the light weight and shorter skirts.

That these deductions are correct was shown by Case No. 41, a charming young girl, sixteen years and two months old. This young girl has a strength factor of 26.6, 0.2 greater than her brother fourteen months older, and the same strength factor as the average of the 203 athletic men examined by Dr. Martin and Mr. Rich.[10] The boy and girl were brought up with the same occupations and physical activities until the girl was twelve years old, when she was graduated from her overalls into skirts and into some of the conventional, physical limitations of women. She is very feminine in type, an unusually good tennis player, is musical and is intellectually

[10] Martin, E. G., and Rich, W. H., "Muscular Strength and Muscular Symmetry in Human Beings—II. Adult Males." *Am. Journ. Phys.*, Vol. 47, No. 1, Sept., 1918.

of great promise. She showed only slight variation from her brother in hip extensions and flexions, considered either in pounds or in percentage distribution.

*TABLE 3.—COMPARISON OF CASE 41 AND HER BROTHER

	Hip Extension		Hip Flexion		Knee Extension		Knee Flexion	
	Lb.	%	Lb.	%	Lb.	%	Lb.	%
Case 41	155	4.41	95	2.85	113	3.21	50.5	1.43
Brother 14 months older	159	4.41	102	2.80	113	3.14	62	1.72

Case No. 36, aged 42 2/12, is married, has borne three children and has a strength factor of 25.3. She said: "I have played running games and a little football, climbed trees, ridden horseback, played tennis in college and had four years of gymnastics. When there was anything to do, such as moving a piano or a trunk, it never occurred to me to call a man. I did whatever there was to do. I have never worn a corset and my clothes have been loose and supported. When fashion demanded three petticoats, I wore one." In this middle period of life, she has retained her youthfulness and sparkle to an unusual degree and is intellectually brilliant. The skirt may bring about pelvic congestion and favor the development of enteroptosis when worn unsupported; this is equally true when worn unsupported and without a corset. At this point it may be desirable to give in some detail the method by which we arrived at the conclusion that there is no difference in the muscular strength of men and women, which is due to sex as such. The world war had called women to tasks totally unsuited to the accepted standards of women's physical strength and capacities. At that time, therefore, when our nation needed to mobilize every particle of woman power as well as man power, it seemed well to determine with as much definiteness as possible what that power was. In the case of woman particularly, it was useful to know whether these unprecedented demands on her strength and activities were liable to make her racially less efficient and whether many of the handicaps were real or only traditional. In hope of gaining more exact information concerning the muscular strength of woman, this study was undertaken.

Dr. Martin's method[11] of testing muscular strength, originally devised for the study of cases of anterior poliomyelitis, was used. Forty-five average, healthy, college women, most of whom had always been physically active, although, in the majority of the instances, not specially athletic, were studied.

In the progress of this work, certain inprovements in the manner of applying the spring balance method to adults were devised.

The following groups of muscles, both on the right and the left side of each woman, were tested: pectorals, latissimus dorsi, anterior and posterior deltoids, forearm extensors and flexors, wrist extensors, thumb adductors and either wrist flexors or finger flexors. The wrist flexion test was found by some of the women to cause lameness. The finger flexion was substituted in the later testing. These muscle groups were tested with the subject standing. The following tests were made in the horizontal position: dorsal flexion, inversion and eversion of foot, adduction and abduction of thigh, hip extension and flexion, knee extension and flexion.

Thus, a full test included observations of thirty-six groups of muscles. Each test was repeated two or three times, thus insuring as accurate observation as possible by securing the maximum cooperation of the woman on whom the tests were made. The highest record correctly made was used in each case.

*TABLE 4.—AVERAGE, MAXIMUM AND MINIMUM STRENGTH FACTORS OF FORTY-FIVE WOMEN ARRANGED IN AGE GROUPS

Ages	16-20	20-25	25-35	35-56	All Ages
No. of cases	10	26	5	4	45
Average strength factor	21.5	23.8	23	20.8	22.5
Maximum strength factor	26.6	30.4	25.3	25.3	30.4
Minimum strength factor	18.4	19.3	18.7	16.6	16.6

These forty-five women were tested one hundred and twenty times; there were ninety-five full tests and twenty-five partial tests. Every woman was tested from two to five times, and 3,576 muscle groups in the forty-five

[11] Martin, E. G., and Lovett, R. W., "A Method of Testing Muscular Strength in Infantile Paralysis," *The Journal A. M. A.*, Oct. 30, 1915, p. 1512. Lovett, R. W., "The Treatment of Infantile Paralysis," p. 152.

women were tested. Dr. Mosher made schematograms[12] of all the women studied.

A convenient method of classifying the persons studied is in terms of the strength factor, which is simply the figure obtained by dividing the total strength, as determined by the tests, by the weight. In Table 5 the strength factors for the entire group of cases are summarized.

In Table 4 the cases are grouped in accordance with their strength factors. A study of the table shows that the first group, which has the lowest average strength factor, 18.78, is made up of the tallest and heaviest women, with 50 per cent. of them overweight, the average overweight being 30.1 pounds. In this group, also, three of the eight women are immature physically, though not sexually, and six, or 75 per cent., show a marked lack of coordination.

The third group has an average strength factor of 26.77, which is slightly greater than the strength factor of the group of athletic college men. This group of women is especially remarkable because it is made up almost uniformly of the most perfect feminine type. Two cases, (28 and 42), which fall somewhat below this standard, will be discussed later. Members of the third group of women are, on the average, shorter, more compactly built and lighter in weight than members of either of the other two groups.

We find here, with only two exceptions, the women with the highest degree of coordination. The most striking fact in connection with the women of this group is, perhaps, their history in regard to exercise. Without exception, they have always been physically active, playing with brothers and boy cousins without distinction of sex, sharing the same games and having the same activities.

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[12] Mosher, Clelia D., "The Schematogram—A New Method of Graphically Recording Posture and Changes in the Contours of the Body," *School and Society*, Vol. 1, May 1, 1915.

TABLE 5.—FORTY-FIVE WOMEN ARRANGED IN GROUPS ACCORDING TO STRENGTH FACTOR

	Strength Factor 20 and Below	Strength Factor Above 20 and Less than 25	Strength Factor 25 and Over
Number of cases	8	26	11
Strength Factor:			
Average	18.78	22.3	26.77
Maximum	20	24.6	30.4
Minimum	16.6	20.3	25
Total Strength:			
Average	2,789	2,960	3,513
Maximum	3,220	3,330	4,130
Minimum	2,320	2,565	3,060
Average age	27	23.5	23.9/12
Maximum age	56	58.3	42.4/12
Minimum age	18	18	16.2/12
Average height	65	64.5	63.7
Maximum height	68.9	67.7	66.4
Minimum height	62	60.2	59.6
Average weight	148.9	133.6	131.6
Maximum weight	170.8	154.5	165.5
Minimum weight	119.8	116.4	112.9
Overweight (5 pounds)	(4)	(12)	(5)
Average	30.1	15.78	15.5
Maximum	39.5	32.5	39.5
Minimum	11	5.3	5.4
Underweight (5 pounds)		(5)	(2)
Average	†	11.4	9.1
Maximum	†	17.8	13.0
Minimum	†	5.2	5.3

† None over five pounds.

Case 28, with a strength factor of 28.4, and Case 42, with a strength factor of 25.5, also rather immature, fall somewhat below the high average standard of type in this group, although they both, in regard to the secondary sexual characters and functionally, are normal women. Both belong to the tall, lean type, though they lack the poise and balance found so uniformly in this group. They are precipitate in action and show a lesser degree of co-ordination than the other members of their group.

Four married women, ranging in age from thirty-four to fifty-nine years, gave an average strength factor of 20.8. The maximum strength factor in this group is 25.3, which is considerably above the average of the whole group of forty-five women and is exceeded by only five others in the whole series of women studied. The four women of this group have borne thirteen children.

A general comparison of the series of forty-five college women with the series of athletic college men by Dr. Martin and Mr. Rich yields some suggestive results.

TABLE 6.—STRENGTH IN POUNDS OF 203 ATHLETIC MEN AND 45 WOMEN

	Maximum	Minimum	Average
203 men	5800	2000	3900
45 women	4130	2320	3060

It is interesting to note that Table 6 shows that the strength of the weakest woman was 320 pounds greater than the strength of the weakest man.

Let us now consider briefly the strength of the different muscle groups as shown in Table 7.

TABLE 7.—AVERAGE PERCENTAGE DISTRIBUTION OF STRENGTH IN MEN AND WOMEN

	Athletic Men	Women	Children
Feet:			
Dorsal Flexion	2.85	3.07	3.20
Inversion	1.90	1.95	
Eversion	1.80	1.35	
Thighs:			
Adduction	1.60	1.68	
Abduction	1.50	1.475	
Extension	3.70	3.42	
Flexion	3.20	2.69	
Knees:			
Extension	3.30	3.175	
Flexion	1.75	1.30	
Shoulders:			
Pectoralis	2.35	2.1	
Latissimus dorsi	1.45	1.65	
Anterior deltoid	2.1	2.45	
Posterior deltoid	1.35	1.80	
Forearms:			
Extension	1.5	1.3	
Flexion	2.35	1.85	
Wrists:			
Extension	1.00	1.30	
Flexion	1.35	1.90	

The pectoral muscles are commonly relatively stronger in man than in woman, the average percentage of total strength being 2.35 in man and 2.1 in woman. Twelve women have equalled or exceeded the average of the men. Case 35 from the second group, a married woman who has borne two children, has in her pectorals 2.52 per cent. of her total strength. This difference between men and women, which is, therefore, apparently not one of sex, may be explained as due to difference in use. Constant ball playing, punching and thrusting make up a very large part of the boy's exercise. His clothing does not limit the use of the pectoral muscles, as do a woman's waist, brassière, etc. Moreover, although dress and convention have discouraged the use of the pectoral muscles in woman, their weakness is a distinct racial disadvantage. If the pectoral muscles were well developed in the woman, we should find fewer pendulous breasts in the young girl, as well as in the older woman.

The latissimus dorsi muscles are better developed in the woman than in the man, contributing 0.20 per cent. more of the total strength of the women than of the man. The buttoning of woman's waists and skirts in the back brings these muscles into constant use from childhood, while the boy's clothes are always more conveniently buttoned on the side or in front.

The anterior deltoids in woman create 0.35 and the posterior deltoids 0.45 per cent. more of the woman's total strength than the man's. This difference again is readily explained as due to the difference in use—that is, to the woman's constant practice of putting up her hair. It is common knowledge that the girl with heavy hair cries with fatigue day after day as she is taught this conventionally necessary use of her muscles. An athletic woman, not considered in this series of observations, tells me that the fatigue of putting up her heavy hair on the top of her head is still so great that she has been forced to dress it low after repeated attempts.

There is no occasion for a habitual use of the deltoids among men and, furthermore, their heavy coats tend to limit the freedom of action of the deltoids.

Forearm extensions and flexions are better developed in man than in woman, making 0.20 and 0.50 respectively more of the man's than the woman's total strength. Here, again, woman's close-fitting waists and sleeves and the conventional view of her physical delicacy, which would protect her from lifting all heavy weights, might at least partially explain this difference.

Wrist flexion is found to be 0.55 and wrist extension 0.25 per cent greater in the woman as compared to the percentage of distribution in the man. This is readily explained by the constant, small movements in sewing, knitting, etc., which form a large part of woman's occupation. Piano playing also is probably more frequent among women than among men.

The result of differences in use is especially well illustrated in a brief consideration of dorsal flexion. Children between the ages of five and sixteen years show 3.20 per cent., women 3.07 per cent. and men 2.85 per cent. of their total strength. Strapping the foot to the stiff unyielding sole of modern shoes might account for the falling off in power of these muscles in the adult. That woman has considerably more power than man may be due to the fact that she is more commonly trained in dancing, as was the case in this series of college women as compared with the college men.

Inversion shows little difference between men and women, the percentage being 0.05 greater for the men than for the women. Eversion makes 0.135 per cent more of the total strength of the woman than of the man. Again, the fact that a large number of these women had some training in aesthetic dancing may be a factor in the difference.

Adduction is responsible for 0.08 more of the woman's total strength than of the man's. This may possibly be influenced by the conventional requirement of lady-like behavior, which demands that a woman's knees be kept together.

Abduction causes little difference, being 1.50 per cent. of the man's total strength and 1.475 per cent. of the woman's. Thus we were able to come to the following tentative conclusions:

There is no difference in the muscular strength of women and men which is due to sex as such. Such differences as are frequently found are due to differences in the use of the muscles, brought about by the conventional limitations of activity or by dress. Marked overweight or marked underweight tends to lower the strength factor, as does also lack of coordination, which is too frequently found in women and exaggerated by their scant, physical activity in childhood. The effects of muscular training apparently persist long after the particular exercise has ceased. A high degree of muscular power in a woman in no way lessens her racial efficiency. Lack of muscular power, as in the pectoral muscles, may be a distinct racial disability. Since we know that periodic disability in a woman when no organic disease exists is readily eliminated,[13] we may, therefore, conclude that sex is not necessarily a disability and that if some method be found of adjusting work to the individual strength under proper, hygienic conditions, without reference to sex, there is no reason why the potential power of woman may not be used without danger of lessening her racial efficiency.

[13] Mosher, C. D.: "A Physiologic Treatment of Congestive Dysmenorrhoea and Kindred Disorders Associated with Menstrual Function," *The Journal A. M. A.*, April 25, 1914, pp. 1297-1301; Health and the Woman Movement, 2d Edition, The Womans Press, 600 Lexington Ave., N. Y. City, 1918.

Feminine handicaps would seem to be reduced to the loss of time necessary for the bearing of children. Certainly, at the present time the highly differentiated modern woman can hardly hope universally to reduce this necessary loss of time to the minimum attained by the janitress of a school in one of our eastern cities. She was the mother of a baker's dozen of healthy children. She lost not a day's work from year's end to year's end, and at the birth of a child would, when the time came, go home, leaving her mop in the pail and, having been delivered, return in a couple of hours and finish her mopping. So the problem would seem to be not to minimize feminine handicaps, but to dispose of them altogether. We cannot hope to reach the highest places in our fields of endeavor while so much time, thought, energy and money are spent on clothes and fashion. No one can hope to attain preeminence in her own field of work and be her own tailor, dressmaker, milliner and laundress.

Since it is use and not sex which determines the strength of muscles, the physical inequality of men and women will last just as long as the girl occupies her leisure time making tatting to decorate her clothes while her brother spends his leisure playing ball.

We must go back to the old Greek idea of physical perfection for both men and women. With the present generation of women we may have to compromise, because with them the idea of incapacity is firmly fixed in traditional thinking, and it is neither easy to acquire the habit of exercise in adult life nor can we fully make up for the lack of physical freedom in childhood; still, much can be done.

If we can put aside the old idea that being a woman is a handicap and bring up the girl children of to-day, mentally and physically free, clothe them so that they may not be hampered in time or work, there is no limitation on what we may expect from the coming generation. Let us make use of anything that the man has found useful, if it is adapted to our purpose, but at the same time remember that because it is a man's is no reason

for so doing. Let us firmly keep in mind that we are not to imitate servilely the man, but make ourselves more perfect women, fulfilling our own great place in the world. In the much needed work of freeing women from the traditional handicaps, a work which all thinking people must recognize, let us not make the mistake of losing sight of woman's primal function—motherhood. Because of our necessary concentration on the training of women for her economic place in the world, we must not divert the girl's attention too much from her racial obligations, since she in consequence may recognize too late the fact that no woman reaches her fullest development who is not a wife and mother.

DISCUSSION

DR. STANG: I fully agree with what has been said by Dr. Mosher—only I want to add a few words on the use of the brassière. I do not feel that this is the cause of the pendent breast. I know girls who never wear a brassière, but have mammae pendentes, which probably represent a special hereditary type.

DR. THUILLIER-LANDRY (translated from French): In regard to the endurance of women, in France it has been noticed that in the beginning women are able to work as hard as men, but little by little they become exhausted.

DR. GIBOULOT (translated from French): There is a difference between the two sexes, due to the lack of training. That is true. But there is a deeper difference between the two sexes due to an internal secretion. This is demonstrated by the changes that take place in women when the ovaries are removed by operation. The women in the factories during the war who worked long hours are now exhausted. Many could not stand the work; they became tuberculous. So there is a difference between a man who is not trained and a woman who is not trained—there is a deep difference which makes the struggle of life more difficult.

DR. MURRELL: I should like to suggest that the sex difference which has to be admitted, due to the internal secretion, is one dealing with the emotional and not with the intellectual nor necessarily with the muscular condition of the woman. (Applause).

A DELEGATE: I want to disagree with Dr. Mosher about the brassière. There are certain kinds of brassières which are suspended from the shoulders and are good for those women who have the pendent breast.

DR. SUNDQUIST: The question about sex differences is a very difficult question. I think it is a question that cannot be solved in a discussion like this. I think, however, we all can agree upon the fact that for the present the young girls need much more physical training than they have and we can all agree upon the fact that the muscular condition of the present generation of young girls is not satisfactory. We need a better condition; we need more muscular training, whether there is an inherent sexual difference or not.

A DELEGATE: Dr. Mosher brought out the fact that girls should not be incapacitated at the menstrual time, and we will agree with her. What I want her to tell us is, in Leland Stanford is it their custom to excuse their students from the gymnasium floor for the first two days.

DR MOSHER: In regard to the brassière, I am sorry I gave the impression I did not think a brassière properly worn might not be necessary sometimes. I was simply speaking of the normal breast and the way the average girl wears her brassière. She puts it on in such a manner that she drags the breast down each time in her effort to conceal it, and I called attention to the fact that the normal breast in a normal position is inconspicuous.

As to Dr. Stang's remark, another factor in the pendulous breast is the change in weight. If you have a breast which is reduced in the amount of its fatty tissue, you are going to have a tendency towards flabbiness, just as you will have a tendency towards enteroptosis, if you have a change in the abdominal fatty tissue. You may have to support the organs to prevent a pathological condition developing.

In reference to the question of fatigue in the women workers, as compared to the men, I was working, of course with college girls. The question of fatigue is not a question of sex. A man from the earliest time has a degree of physical activity that the average woman never has because of the conventional limitations of activities and because of her clothes. It is no wonder that when the woman, who has had no physical training and no activity and who is improperly clothed, so far as physical freedom is concerned, takes up this work, this heavy work, without any preparation, she is fatigued. A man in the same physical condition would experience the same result.

With regard to the changes in a woman who has had ovariotomy, it seems to me I have heard of changes in the male after castration. I have records of a large number of women who have distinguished themselves during the menopause and afterwards and the overies are not active after the menopause.

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