

THOSE PESKY DOUBLE-UNDERS AND THE 10 METER DASH

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You've probably guessed that this isn't about jumping rope. It's about the 10 meter dash, more or less, depending on which bathroom is empty and what happens to us when a cough, sneeze, laugh, run, or jump causes urine to leak, other than frustration, anger, and acute embarrassment? The volume of urine leakage is generally very little at each occurrence, so low that we might say: "What was *that* all about?!" We know this as *stress incontinence*, which is usually the result of weak pelvic floor muscles and/or weak bladder-neck supports in both men and women. Armed with a little knowledge about the pelvic muscles and the mechanisms involved in urinary continence, we can often help ourselves by doing something we are very familiar with—exercise.

What happens? Jumping rope, a hard cough, laugh, or sneeze causes a sudden increase in pressure within the abdomen and simultaneous contraction of the abdominal wall and the diaphragm. These events move the abdominal contents downwards, displacing the angle between the urethra[§] and the bladder-neck by about 10 mm—enough to cause leakage of urine in women and men with weak pelvic floor muscles.¹ In people with strong pelvic floor muscles, this increased intra-abdominal pressure results in stretch resistance of the big pelvic floor muscle (the *levator ani*). The result is that the pressure in the urethra is suddenly more than that in the bladder, successfully keeping the urethra closed – perfect, as it was meant to be! However, this sequence can be defeated by weak pelvic muscles. The way you are physically training, could you possibly have a weak muscle fiber any place in your body? Well sure, especially if you've had more than one baby, are an older woman or an older man, and are not making an effort to strengthen that forgotten big sling of a muscle that defines your pelvic floor — the *levator ani* and the urethral sphincters.

Although more common in multiparous women or in older women who haven't had children, One article claims stress incontinence to be a factor in more than a quarter of college athletes when participating in sports.² An uncontrolled study of 1,956 men and women aged 60 who were interviewed in their homes in Washtenaw County, Michigan reported the prevalence of urinary incontinence at 19% of the men and 38% of the women. Although based solely on personal interviews, this was a large study by a respected group of scientists, and people tend to be more open with a stranger than with someone they know, possibly because of the protection of anonymity.

Women after childbirth. Depending on the size of the baby and the length of the second stage of labor, childbirth may damage muscles and nerves of the pelvic floor or disrupt the posterior angle between the bladder wall and the urethra. Normally, this angle, maintained by a sphincter muscle, helps to seal the urethra at the bladder neck and is intact until the first stage of voiding when the full bladder descends fully into the pelvis, obliterating the angle and causing urine to be released.

[§] The *urethra* is a narrow tube leading from the urinary bladder to the outside of the body. The female urethra travels next to the vagina, exiting above the vaginal opening and below the clitoris.

The elderly. The elderly know that their skeletal muscles are not as strong as "*a few years back*" and are heard to mutter "*I used to be able to lift more weight.*" The same goes for the muscles of the pelvic floor. Even when injury-free, these muscles are predictably not as quick nor as strong as that of the young adult.³ In women this is due, in part, because age-related decline in estrogen may weaken the urinary sphincter.

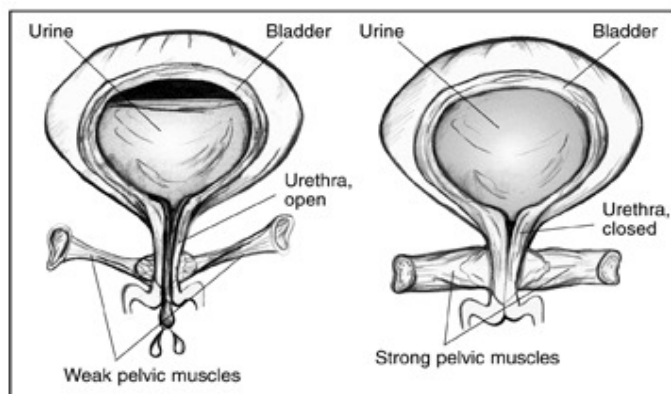
All of this having been said, neither having babies nor growing old means that incontinence will necessarily be a problem.

Prolapse. When not supported by competent pelvic floor muscles, the pelvic organs may push down against the vaginal wall causing it to bulge inward; the bladder and the rectum are, after all, just adjacent to the vagina anteriorly and posteriorly. Prolapse is inconvenient and a disappointment, but it's not "the end of the world", nor is it necessarily associated with stress incontinence. It can be permanently repaired with surgery in competent hands and temporarily and effectively reduced with a vaginal pessary (which looks like a diaphragm with holes in it.) Good results have been reported in over 95% of surgical patients with rapid return of normal bladder function, if that was a factor.⁴

PELVIC FLOOR MUSCLE TYPES IN MEN AND WOMEN

Type I muscle fibers. The group of striated (voluntary) muscles known as the *levator ani* form a sling to support the pelvic organs and provide fibers that wrap around the urethra in men and both the urethra and vagina in women to form the urethral sphincters. At least 80 percent of their fibers are Type I. Their contraction produces less force than Type II, but helps improve muscle endurance by generating a slower, more sustained, less intense, but fatigue-resistant muscle contraction. So, we exercise them to suit their nature - slow to generate and longer to hold.

Type II muscle fibers. These fast twitch fibers, also voluntary, aid in quick and forceful contractions and are normally activated during sudden increases in intra-abdominal pressure (full bladder, cough, jump rope, etc) to block urine flow by clamping down on the urethra. We exercise them with a quick hold and release, shown in illustration below.



GETTING STARTED — KEGEL EXERCISES

NOT JUST FOR WOMEN

The Kegel exercises are the same for men and women. Women have heard of them and many use them successfully. The tendency is to forget about them once successful and then drift back into incontinence. Men shrug and think: "*Not for me!*" Dr. Jonathan Vapnek⁵ (Mount Sinai School of Medicine), reminds the men that the Kegel exercises are not just for women. Men benefit too. Not only will urinary and bowel incontinence be reduced, but prostate discomfort may be eased and premature ejaculation relieved. The Kegel exercises strengthen type I muscle fibers – slow to generate, longer to hold. Both men and women report enhanced sexual pleasure as a bonus.

IDENTIFY THE CORRECT MUSCLES

Start by learning what it feels like to control the sphincter muscles that hold back the flow of urine. This is a very easy, repeatable, and instantly verifiable exercise. When voiding, try to interrupt the flow of urine midstream with a quick, strong **hold and release** contraction. Repeat several times.

Keep trying. Do not give up! You are isolating a specific set of muscles that may be new to you, so it may take a bunch of tries to finally get the knack of it. *This effort should not involve engaging the abs, relax them.* If you are not sure that you have identified the correct muscles, men can look for a movement of the penis at its base; women will feel a lifting and tightening of the vagina, as the muscles of the pelvic floor shorten.

When you do finally stop the flow of urine mid-stream (Fig. below), you will KNOW that you are in touch with muscle fibers that need to be strengthened — instant verification!! You are now ready to begin the Kegel exercises and discontinue the exercise by which you interrupt the flow of urine. It is important to allow the bladder to respond to the stretch of being full and contract without interruption. Always make sure that your bladder is completely empty. Leaving little puddles behind is an invitation to bacterial infection (cystitis), especially for women because of the shorter urethra.

THE KEGEL EXERCISE

The instructions below are those of Jonathan M Vapnek MD.⁵

Begin by lying on the floor with your knees drawn up, feet flat on the floor; this position is meant to relax your abs, gluts, hams and quads.

One Kegel: Slowly tighten, lift and draw in the pelvic floor muscles, squeezing as hard as you can for 3-5 seconds. Then relax for 3 seconds. Start with 5-10 repetitions. As you get stronger you will easily be able to hold the contraction for 10 seconds for 20 repetitions.

It may take anywhere from one to three months to see results. A common mistake is to give up after success. Don't do it! You will drift back to stress incontinence. These muscles are like any other. They need *regular training*.

If you do not respond to the exercises, consult your Physician. MRI may be indicated to visualize the problem and surgery may be needed to repair and improve the support of the bladder neck and return muscle support for the other pelvic organs.

TIME BETWEEN VOIDINGS

Once you gain in the control of your bladder, slowly start lengthening the time between voidings. If you are on a very short 2 hour schedule or even less, this is not a normal pattern. Start gradually lengthening the time to the more normal range of 4 to 8 hours. The normal bladder will give you plenty of warning. When it's about half full (200-300 ml) stretch receptors are activated in the bladder wall where small contractile waves occur. But, you still have plenty of time; this is just a warning. The normal bladder muscle is elastic and capable of containing 400 to 600 ml and still allow for more fluid without causing the pressure in the bladder to be higher than that in the urethra.

The elderly. Many older adults don't get that early warning when the bladder is only half full. With aging of the bladder muscle itself and possibly the nerves that innervate it, the urge to void may not be felt until the bladder is full or nearly so. To the strong, active, person this may be merely an exasperating inconvenience. But to an immobile elderly person it spells incontinence.

You now have all the information you need to improve the strength of your pelvic floor muscles. For the interested, the remainder of the article describes and illustrates in detail the muscles strengthening the female urethra and the additional advantages of the Kegel exercises for men and women.

THE FEMALE STRESS INCONTINENCE CONTROL SYSTEM

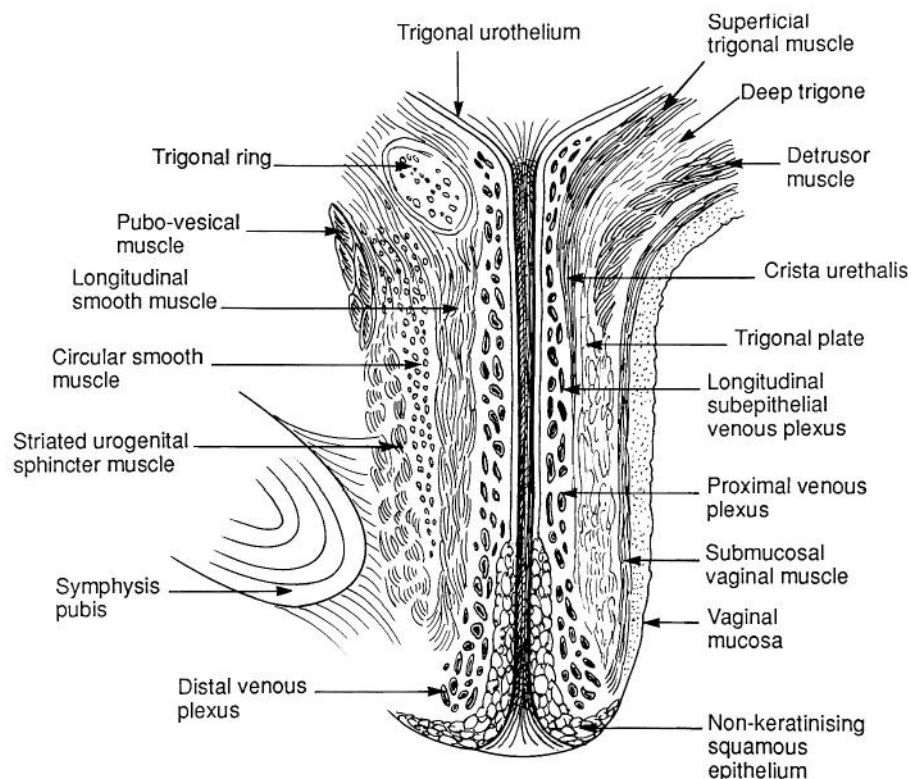


Illustration from: Ashton-Miller JA, Howard D, DeLancey JOL: The functional anatomy of the female pelvic floor and stress continence control system. Scand J Urol Nephrol Suppl 2001; (207):1-125.

A few terms will help make sense of the drawing, which is a front to back (sagittal) section of the female urethra, its layers of striated (voluntary) and smooth (involuntary) muscle. The artist has drawn different depths on either side of the urethra so that you can see the complexity of the layered structure. The drawing is very complex, but we can't help but be impressed with the armament for urinary continence. In women the external urethral sphincter (surrounding the urethra) is composed of three separate divisions of the *levator ani* muscle. One wraps solely around the *urethra* and loops around the rectum to give it support, as it does in men. A second one wraps around both the *vagina* and the *urethra* and contracts to constrict both channels. A third wraps around the front of the *urethra* and contracts to squeeze the urethra against the vaginal wall.

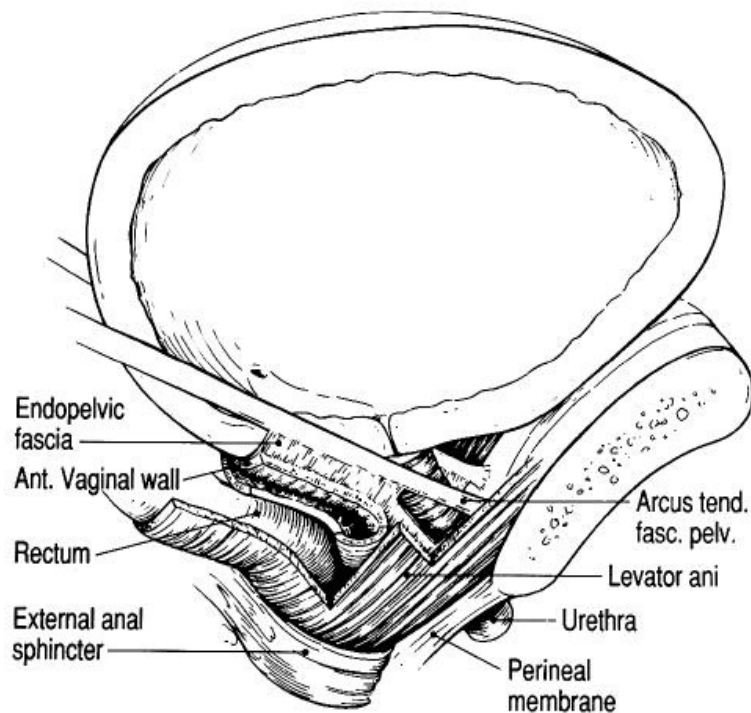
Symphysis pubis bone is on the lower-left. Find the pubic bone first to get your orientation to the front of the body. Note the vaginal mucosa at the far right, which helps one appreciate the anterior/posterior orientation. Now, let's start from the top down to find the muscles that protect and strengthen the female urethra.

Detrusor muscle (top right) is the bladder muscle, which, along with the **trigonal muscles**, continues into the wall of the urethra for about 15 % of its length.⁶ These are smooth (involuntary) muscles that maintain continence during rest.

The striated urogenital sphincter muscle on the far left is an external voluntary urethral muscle—long and strong and the one we consciously contract to stop urine flow. It wraps around the urethra down to 76% of its length⁷ – impressive!

Next are two involuntary muscles, the **circular smooth** and the **longitudinal smooth muscles** that also wrap around the urethra to maintain urinary continence during rest. Now, find the vaginal mucosa on the right and note that the entire posterior border of the urethra is attached to the anterior vaginal wall.

THE FEMALE URETHRAL SPHINCTERS



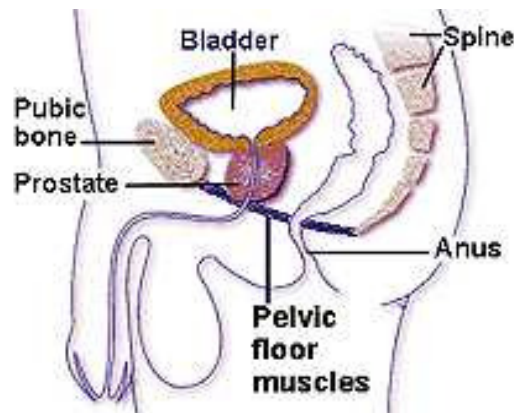
(Illustration from: Ashton-Miller JA, Howard D, DeLancey JOL: *The functional anatomy of the female pelvic floor and stress continence control system*. *Scand J Urol Nephrol Suppl* 2001; (207):1-125.)

The drawing above may be a bit confusing if you haven't studied these muscles before. This is a look into the female pelvis from the side so you can see the urethra, vagina and rectum from right to left. The big urinary bladder dominates the picture on top, with the exit into the urethra very evident. Now that you can see the beginning of the urethra, follow it down as it passes behind the levator ani muscle to just below the pubic bone - the solid looking structure, far right. The vagina is cut so that you can see its attachment to the urethra and that long arcus tendon.

Note how the big wide *levator ani* muscle arises from the pubic bone and not only forms a sling to support the urethra, vagina, and rectum, but sends a significant division off to wrap around the urethra and vagina and another division proceeds back to the coccyx, making a U-turn around the rectum. There are also vascular beds within the submucosa⁸ as well as dense fibrous connective tissue (*endopelvic fascia*) that surround the vagina and attach laterally to a tight tendon-like cable, which binds the urethral and vaginal walls to each other and maintains the angle of the urethra to the bladder that is so important to urinary continence. This fibrous band (*arcus tendineus fasciae pelvis*) is attached to the pubic bone and merges with the levator ani muscle.

Along with the sphincter muscles described above, these muscles, tendons and fascia provide us with an impressive defense against incontinence. Nerves and blood vessels are of course also involved and critical, but we can be in touch with and work to strengthen those muscles.

THE LOCATION OF THE MALE PELVIC FLOOR MUSCLES



Male urethral sphincters. In men, fibers from the striated (voluntary) muscle (*levator ani*) wrap around the urethra just below the prostate gland. The levator ani is a long wide muscle that forms a sling on the pelvic floor. The illustration, the only one I could find, doesn't even remotely indicate the divisions, which are the same as described for the female with obvious differences. In the male, this multifunctional muscle branches off to circle the urethra, becoming a sphincter just under the prostate gland, with some of its fibers meshing with that gland. Another division of the *levator ani* loops around the rectum for support. Men also have an internal smooth (involuntary) sphincter muscle. It is located at the bladder outlet and is a continuation and thickening of the main bladder muscle. This sphincter muscle is above the prostate. Its purpose is to maintain continence during rest and sleep, and prevent reflux of seminal fluids into the bladder during ejaculation.

Causes of incontinence in men. Nerve damage (injury, diabetes, stroke, etc) and prostate problems (benign hyperplasia, prostatectomy, radiation) are significant causes.

Obesity figures in because it markedly increases the risk of benign prostatic hyperplasia. Physical activity and weight loss decrease this risk.⁹

Kegels for improved sexual function. Dr. Vapnek⁵ has supplied further information for both men and women. "Those who experience premature ejaculation can learn to delay their orgasm by squeezing the muscles hard during intercourse. Women can use Kegel to create more friction during intercourse and reach orgasm sooner."

The message here has clearly been that all adults, young, old, male, female, multiparous, or nulliparous can benefit from Kegel exercises. It's fair to say that the impressive and important muscles of the pelvic floor should not be ignored in our daily training to be strong — let them be the focus of your own personal WOD.

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⁷ Ashton-Miller JA, Howard D, DeLancey JOL: **The functional anatomy of the female pelvic floor and stress continence control system.** Scand J Urol Nephrol Suppl 2001; (207):1-125.

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