

## Age as a Variable in an Exercise Program for the Treatment of Simple Urinary Stress Incontinence

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**This study compared the effectiveness of biofeedback on pubococcygeal muscle strengthening and simple urinary stress incontinence in older and younger women. Women aged 55 years and older and women younger than 55 years of age were taught Kegel exercises, using biofeedback, for the treatment of simple urinary stress incontinence. Eighty percent of the younger group and 67% of the older group eliminated stress incontinence. Also, the younger women required less pubococcygeal strength than the older women to control incontinence.**

The pubococcygeus is the key muscle in the female pelvis which controls urine loss during increases of intraabdominal pressure.<sup>1,4,17</sup> Inadvertent voiding under such conditions is called simple urinary stress incontinence and is the most common type of urinary incontinence in women.<sup>2-6</sup> Deterioration of the pubococcygeus and the associated symptoms of stress incontinence can result from a combination of childbirth trauma, anatomic structure, and the aging process.

Embarrassment, or fear of embarrassment, because of stress incontinence often leads to curtailment of activities and social interaction and increasing social

isolation.<sup>7</sup> Families may conclude that incontinence in an elderly member and the resulting loss of the quality of life and the threat to independence make caring for the elderly women in the home impossible. This conclusion may greatly influence the decision in favor of institutionalization.

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### LITERATURE REVIEW

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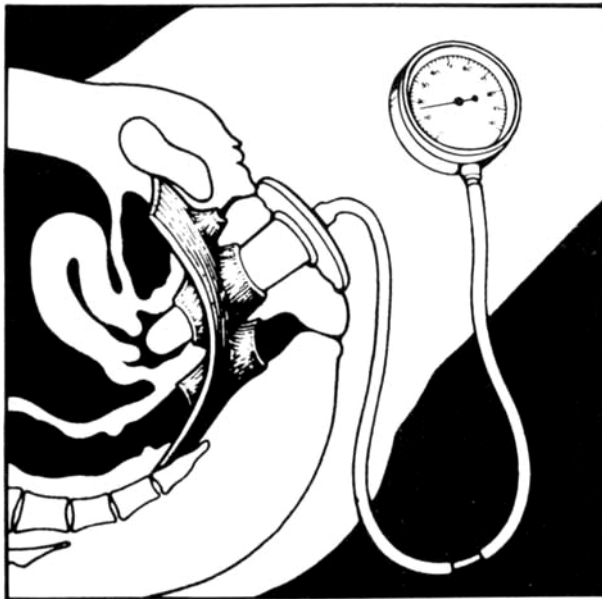
Surgical interventions, such as anterior and posterior repair and the Marshall-Marchetti-Krantz procedure have been the most popular methods of treating stress incontinence. Estimates for long-term success rates of surgical interventions vary. Witty cites a 50 to 60% success rate, with continence lasting for "at least 6 to 12 months or more."<sup>8</sup> Nichols states

that "a two-year cure rate of urinary continence approaching 95% (is achieved) only by well-considered appraisal of a patient's problem. . . . Without such effort . . . an overall failure rate of not less than 20% (is to be expected)."<sup>9</sup> Stanton notes that "cure rates for incontinence (following anterior colporrhaphy) vary from 37 to 90%," with effective control of stress incontinence being 90% with the Marshall-Marchetti-Krantz procedure.<sup>10</sup>

Complications may arise from surgical intervention for urinary stress incontinence. Stanton divides these complications into operative and postoperative categories.<sup>11</sup> For anterior repair, operative complications include "injury to bladder and urethra and venous hemorrhage," and postoperative

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**Figure 1.** Diagram showing Kegel muscle with Kegel Perineometer in place. Reproduced from November/December *JOGN Nurs.* 1983; 12:404.

complications include "vaginal narrowing, recurrence of incontinence, and recurrence of prolapse."<sup>11</sup> Operatively, the Marshall-Marchetti-Krantz procedure may result in "injury to the bladder, venous hemorrhage, difficulty in retaining symphyseal sutures, and ureteric injury" and postoperatively may include recurrence of incontinence, voiding difficulty, and osteitis pubis. Osteitis pubis is found in 5 to 10% of these postoperative patients.<sup>11</sup>

Surgery for recurrent urinary stress incontinence following previous surgical intervention is decreased in effectiveness. Beck reports a "complete failure rate" of "8% after the first operation, 45% after the second operative procedure, and 67% after the third operative procedure."<sup>12</sup> Parnell et al. cite only slightly lower success rates with second procedures than with the first procedure, and according to Parnell et al. "significant complications occurred in 12.6% of the patients."<sup>13</sup>

Kegel reports an 86% cure rate in women with simple urinary stress incontinence, with improvement in the remaining 14%, from

using education and biofeedback for pubococcygeal strengthening.<sup>1</sup> Jones reports similar results.<sup>3</sup> Henderson states that women who were taught a prenatal program for pubococcygeal exercises using biofeedback, were capable of significantly stronger muscle contraction at the postpartum visit than those women who had not been taught during pregnancy. Henderson also notes that as pubococcygeal strength increased, simple urinary stress incontinence decreased.<sup>14</sup> These three researchers use a simple pneumatic biofeedback mechanism, the Kegel Perineometer (Figure 1), for teaching and measuring the effectiveness of exercise and strength of the pubococcygeus. Taylor and Henderson, using an electronic perineometer for measurement and biofeedback, report that as pubococcygeal strength increased, the amount and incidence of urine loss, the means used to protect clothing, and client concern about the problem, all decreased.<sup>15</sup>

These researchers do not identify any complications as a result of a pubococcygeal muscle exer-

cise program. If recurrence of incontinence or failure to achieve continence are viewed as complications of surgical procedures,<sup>11</sup> these signs should also be acknowledged as inherent in the overall evaluation of the success of a Kegel exercise program. Kegel exercises are not indicated as the only way to treat all cases of stress incontinence. However, the Kegel exercise programs deserve serious consideration as treatment modalities in carefully selected cases of simple urinary stress incontinence because of the programs' cited effectiveness, accessibility, absence of complications, relative inexpensiveness, and self-care aspects.

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## METHODOLOGY

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### Sample

A 1986 pilot study was conducted using an experimental pretest-posttest control group design, with self-selected females, aged 55 years and older, who were experiencing simple urinary stress incontinence.<sup>16</sup> These women volunteered to participate, and met the following study criteria: ambulatory, noninstitutionalized, able to speak English, capable of self-care, and not currently suffering from neurogenic bladder problems such as stroke, diabetes, or neuromuscular disorders.

A development of this study was that a group of younger women, meeting the same criteria, heard about the study and sought out the investigators. As a separate experimental group, these younger women were then included in the educational program.

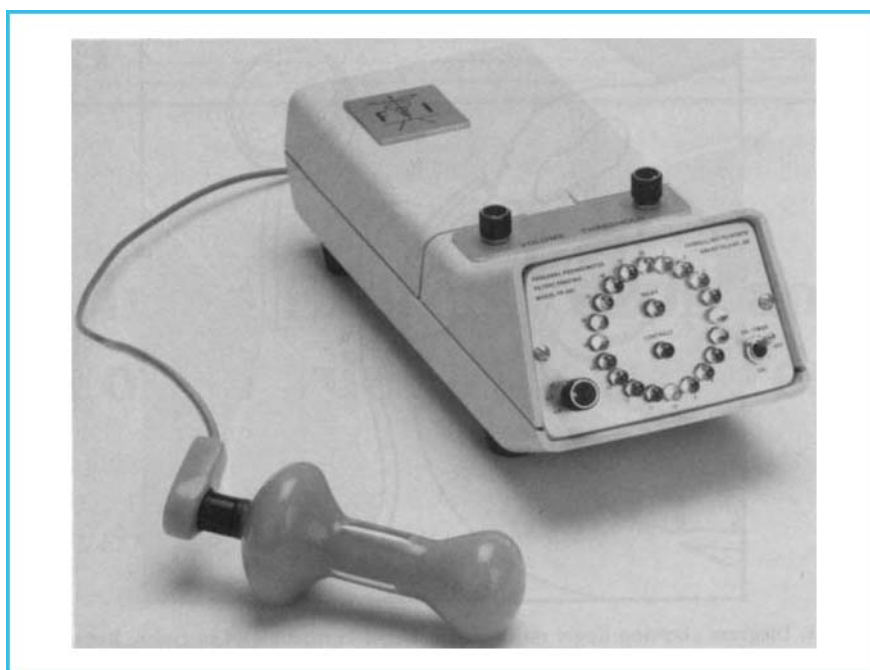
All subjects remained in the study for eight weeks and were required to keep weekly clinic appointments to be counted in the data analyses. All the participants were taught Kegel exercises and used weekly biofeedback in the

clinic setting. After this study, the group of older women was restructured in the data in order to compare younger and older women. Group one consisted of nine women aged 55 years or older (mean, 64.33 years). The second group consisted of five women, aged 54 years or younger (mean, 38.2 years). All the women, in both groups, received weekly biofeedback. The two groups were compared to see if age was a factor in the success of a program for pubococcygeal strengthening in the treatment of simple urinary stress incontinence.

### Instrumentation

The instrument used for biofeedback and measurement in this study was the Personal Perineometer (Farrall Instruments, Inc.) (Figure 2). The mechanical reliability of this instrument has been established by the manufacturer. (Personal Communication with Wm. Farrall, April, 1986). When a known pressure was applied to the electronic vaginal sensor, the instrument translated the electrical activity of the muscle into microvolts which are displayed on a circular bar graph on the face of the instrument. The vaginal sensor, made of sterilizable denture material in which three silver electrodes are implanted, was self-inserted by clients. The Personal Perineometer measured the pressure exerted by the pubococcygeal muscle in increments of 0 to 60 microvolts during contractions of the muscle portion that surrounds the vaginal vault.

At each weekly clinic visit, subjects completed the self-assessment of continence questionnaire (Figure 3) which is designed to arrive at a quantitative assessment of the client's perception of the severity of her incontinence. Scoring was weighted to give increasingly higher scores to coping behaviors that are socially isolating. The in-



**Figure 2.** Personal Perineometer, manufactured by Farrall Instruments, Inc. Reproduced with permission of manufacturer.

dicators of urinary stress incontinence and behaviors associated with stress incontinence included in the questionnaire were compiled from those indicators and behaviors frequently cited in the literature.<sup>4,17,18</sup> D. Cramer Reed, MD, urologist and medical consultant for this study, confirmed that these indicators and behaviors represented the symptomology of stress incontinence and the behaviors used as coping mechanisms by clients with stress incontinence.<sup>1</sup> (Personal Communication, September 17, 1984).

Both Kegel and Reed supported the use of client self-report in determining the status of the client's continence. (Personal Communication, September 17, 1984). The reliability of the self-assessment of continence questionnaire was established through a test/retest of women with stress incontinence who had not sought out treatment and had not been treated for urinary stress incontinence. A two-week testing interval was used. The self-assessment of continence

questions were determined by three experts to be representative of the majority of questions on this subject, thus supporting content validity.<sup>19</sup>

The theory of a nomological network supported the construct validity of the self-assessment of continence questionnaire.<sup>21</sup> The researchers predicted that those individuals who reported episodes of urinary incontinence during activities associated with increased intraabdominal pressure would score 1 or higher on the self-assessment of continence questionnaire and those individuals who had not reported episodes of urinary incontinence during activities associated with increased intraabdominal pressure would score 0 on the self-assessment of continence questionnaire. The 50-subject pretest of the instrument supported these predictions. The pretest subjects reported mild stress incontinence and the researchers predicted that these subjects would score low on the self-assessment of continence

**WET/AMOUNT**

Approximately how often do you unintentionally lose urine?

- A. Never
- B. Less than once a week
- C. One time per week
- D. Two to three times per week
- E. Daily

In the past week have you unintentionally lost urine during any of the following activities?

- Yes/No—Coughing
- Yes/No—Sneezing
- Yes/No—Laughing

Indicate how much urine is usually lost unintentionally during each episode:

- A. A drop or two
- B. A teaspoon
- C. A tablespoon
- D. More than a tablespoon

**PROTECTION**

In order to deal with this unintentional urine loss, do you wear an absorbent disposable panty or use a folded towel?

- A. Never
- B. Sometimes
- C. Usually
- D. Always

During planned exercise, do you:

- A. Change panties with each episode?
- B. Wear a mini pad or panty liner or use facial tissues or toilet paper?
- C. Wear a sanitary napkin or use a folded washcloth?
- D. Wear an absorbent disposable panty or use a folded towel?
- E. Find it unnecessary to protect your clothing?

**CONCERNS**

Does the unintentional loss of urine cause you to wonder if others are aware of this condition?

- A. Never
- B. Sometimes
- C. Usually
- D. Always

leaving nine clients in this group. In the younger group, three clients voluntarily discontinued the program leaving five subjects included in the data analysis.

At the initial visit, and at each weekly visit, clients filled out the self-assessment of continence questionnaire; were measured for pubococcygeal strength with the Personal Perineometer before practicing Kegel exercises; practiced the exercises using the Personal Perineometer as a biofeedback mechanism under the observation and guidance of the researcher; and discussed any problems or questions regarding the program with the researcher. Each of these visits lasted approximately 30 minutes. At the end of the clinic visit, pubococcygeal strength was measured again. During the measurement periods, at the beginning and end of the clinic visits, two readings were taken. These readings were short flicks of unsustained pubococcygeal contractions needed in the immediate control of urine flow such as during a sneeze, and 10-second holds, needed for more sustained control such as during running. This measurement concept was developed by Perry.<sup>21</sup>

Figure 3. Self-assessment of continence questionnaire, sample of questions.

questionnaire. The research predictions were correct. In addition, the self-assessment of continence questionnaire combined a network of observable behaviors related to continence.<sup>20</sup> This evidence suggested that the self-assessment of continence questionnaire measures the construct of urinary stress incontinence.

**Data Collection**

Subjects began the study individually, with 90-minute initial appointments for interview, collection of baseline data, and initial instruction (Figure 4). Each client returned weekly for a period of eight weeks (nine visits including

the initial visit). Kegel claimed that "all patients with simple urinary stress incontinence became dry in two to six weeks in response to the Kegel perineometer resistive exercise."<sup>5</sup> An eight-week period was selected for this study to allow for a possible slow muscle response in the older population. If a subject could not keep her appointment, an attempt to reschedule in the same week was made. If a subject could not reschedule within the week, she was dropped from the study. One subject in the older group had a heart attack during the study and, although she continued in the program, was dropped from the data analysis

**Data Analysis**

Due to the small number in the groups, data were analyzed descriptively. The number of subjects in each group who eliminated stress incontinence was computed. The mean microvolt readings at which each group achieved dryness, the initial and exiting microvolt readings, and the mean microvolt gains in pubococcygeal strength for each group were reported.

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**RESULTS**

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All women in both the younger and older groups reported im-

provements in the frequency or amount of stress incontinence during the study. This finding was determined by self-assessment of continence scores. On the last clinical visit, six of nine subjects of the older group and four of five subjects of the younger group reported *no* incidence of stress incontinence during the preceding week. The mean microvolt ( $\mu\text{V}$ ) readings at which women in the older group achieved dryness was  $10.85 \mu\text{V}$ , whereas  $8.1 \mu\text{V}$  was the mean level at which women in the younger group became dry (Table 1). All women, regardless of age, who achieved a reading of  $12 \mu\text{V}$  or higher, no longer experienced simple urinary stress incontinence.

Mean microvolt readings for pubococcygeal strength as recorded by the Personal Perineometer were calculated for both flicks and for 10-second holds. Initial readings of pubococcygeal strength showed that younger women entered the study with stronger Kegel muscles than older women. However, exit readings revealed little difference in pubococcygeal strength between groups. The mean gain for flicks in the older group was  $4.17 \mu\text{V}$ , with the younger group gaining  $0.5 \mu\text{V}$ . The older group improved by  $4.0 \mu\text{V}$  on the 10-second holds, whereas the younger group gained  $1.6 \mu\text{V}$  (Table 1).

## DISCUSSION

In weekly diary sheets, all women in the older group, except one, reported excellent compliance with the instruction program (Figure 5). The one exception in the older group and all members of the younger group reported only fair compliance. Despite this fact, those women in the younger group were more successful in eliminating stress incontinence

### What the Kegel muscle is:

- Major muscle of support for the pelvic floor
- Attaches at the symphysis pubis and the coccyx
- Surrounds the urethra, vagina, and rectum
- Is experienced as vaginal contractions during climax
- Helps prevent uterine, bladder, and rectal prolapse and stress incontinence



### Importance of the Kegel muscle:

- Stretches and sometimes tears slightly during the delivery process because it is above the level of the episiotomy
- Like stomach muscles, if not exercised, it will not regain tone, possibly resulting in structural prolapse and stress incontinence
- Loss of tone decreases sexual enjoyment by decreasing the strength of contractions felt in the vaginal wall during climax

### How to do Kegel exercises:

- The muscle is about three-quarters of the way up in the vagina
- You can feel it by running your finger along the vaginal wall while tightening the muscle
- Tighten the muscle, hold to a count of ten, relax, and repeat 100 times
- Women should do Kegel exercises 100 times per day for life
- Check if you are doing Kegel exercises correctly by spreading the knees apart while voiding and stopping the stream

Figure 4. Kegel exercise teaching plan.

than those women in the older group. Also, the younger group eliminated incontinence at a lower microvolt reading ( $8.1 \mu\text{V}$ ) than did the older group ( $10.85 \mu\text{V}$ ) indicating that less muscle strength was required to effect a cure in the

younger women than was needed in the older women. This indication was also suggested by the fact that younger women gained less overall pubococcygeal strength during the program ( $0.5$  and  $1.6 \mu\text{V}$ ) than did the older women

**Table 1. Comparison of Microvolt ( $\mu\text{V}$ ) Readings on the Personal Perineometer**

	Older Group	Younger Group	Difference Between Groups
Dry	6 of 9 (67%)	4 of 5 (80%)	13%
Mean for Dryness	10.85 $\mu\text{V}$	8.1 $\mu\text{V}$	2.75 $\mu\text{V}$
Initial Microvolt Readings			
Flicks	5.02 $\mu\text{V}$	8.27 $\mu\text{V}$	3.25 $\mu\text{V}$
Holds	3.22 $\mu\text{V}$	5.7 $\mu\text{V}$	2.48 $\mu\text{V}$
Exit Microvolt Readings			
Flicks	9.19 $\mu\text{V}$	8.78 $\mu\text{V}$	0.41 $\mu\text{V}$
Holds	7.22 $\mu\text{V}$	7.3 $\mu\text{V}$	0.22 $\mu\text{V}$
Mean Microvolt Gain			
Flicks	4.17 $\mu\text{V}$	0.5 $\mu\text{V}$	3.67 $\mu\text{V}$
Holds	4.0 $\mu\text{V}$	1.6 $\mu\text{V}$	2.4 $\mu\text{V}$

(4.74 and 3.39  $\mu\text{V}$ ) (Table 1).

Adequate pubococcygeal strengthening for the elimination of simple urinary stress incontinence may be more easily achieved in women aged younger than 55 years. The finding that younger women entered the study with stronger pubococcygeal contractions than older women may support the view that pubococcygeal strength is decreased as a result of the aging process. In this particular group of younger women however,

three of the five women teach childbirth education classes in which Kegel exercises are a part of the curriculum. These women would perform the exercises periodically, without biofeedback, before participating in the study. As a result, generalizations of the population of women who experience urinary incontinence cannot be made.

The small difference between groups of exit readings (0.41  $\mu\text{V}$  for flicks and 0.22  $\mu\text{V}$  for holds) sug-

gests that, regardless of age, a plateau in female pubococcygeal strength is attained after eight weeks of exercise. However, eight of the nine women in the older group reported excellent compliance with the Kegel exercise program, whereas all five in the younger group reported only fair compliance. With more attention given to the exercise program, younger women may be able to achieve gains in pubococcygeal strength at least equally paralleling those in older women. If, however, the end goal of continence is achieved, actual pubococcygeal strength may become immaterial.

Although most women achieved dryness during the fifth week of the study, this finding was not always consistent for the remaining weeks, particularly if these women experienced coughing or were bothered with allergy symptoms such as sneezing. At some point in the study, seven of the nine older women and all of the younger women were dry for at least one week, but at the end of the eighth week, these numbers dropped to six of nine older women and four of five younger women. A 12-week study with a planned follow-up after one to two years would offer a better evaluation of the effectiveness of this program.

Motivation to practice as instructed was much greater in the older group. This difference may have been a result of lifestyle demands. Most women in the younger group had preschool and school age children which may have made an uninterrupted daily practice regimen difficult. Also, scores on the self-assessment of continence questionnaire indicated a more severe problem in the older group, especially in the area of concern for detection of the problem by others, which may have prompted more rigorous adherence to the program.

Client Participation Sheet						
Client # _____	Week # _____		Date _____			
	Did Kegels 100 Times	Length of Time Spent	Highest Reading	Number of Times Wet	Amount Lost With Each Episode	What Caused This Urine Loss
Monday	_____	_____	_____	_____	_____	_____
Tuesday	_____	_____	_____	_____	_____	_____
Wednesday	_____	_____	_____	_____	_____	_____
Thursday	_____	_____	_____	_____	_____	_____
Friday	_____	_____	_____	_____	_____	_____
Saturday	_____	_____	_____	_____	_____	_____
Sunday	_____	_____	_____	_____	_____	_____
***DO NOT PRACTICE ON DAY OF CLINIC VISIT***						

**Figure 5.** Weekly diary sheets completed by women in study.

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## NURSING IMPLICATIONS

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The responsibility for teaching Kegel exercises for the treatment of simple urinary stress incontinence, with or without sophisticated biofeedback equipment, falls within the scope of nursing practice. Women who experience simple urinary incontinence are eager to learn how to control incontinence and are willing to accept the responsibility for self-care.

The teaching plan used in this study is given to the client in conjunction with a simple explanation, either written or verbal (Figure 4). This teaching plan can be a useful instruction tool, with or without biofeedback. The nursing time required for its application is minimal and the client rewards are often significant, making this plan ideal for use in both institutional and community nursing settings.

### Recommendations for Related Research

Client follow-up is needed to evaluate the long-term effects of this program. Currently, the researchers are seeking additional funding to enlarge the scope of this research. The actual data collection will be taken in twelve national or international research sites.\*

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## CONCLUSION

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Kegel exercises, using biofeedback to enable women to evaluate their own pubococcygeal strengths, are effective in eliminating or improving simple urinary stress incontinence in many women of all ages. However, women aged younger than 55 years may be more successful in this endeavor

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\* If readers feel that they have the expertise and facilities to implement a project such as the one described, the authors would like to discuss this with you.

than those aged 55 years or older. Younger women may eliminate stress incontinence at lower microvolt readings on the Personal Perineometer, and with lower gains in pubococcygeal strength than older women. As a result, younger women may need less pubococcygeal strength to control simple urinary stress incontinence than older women.

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