

Behavioral Treatment of Urinary Incontinence Among Healthy Young Women

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Urinary incontinence is common among young athletic women. For example, nearly one third of 450 female soldiers reported experiencing significant physical stress-induced urinary incontinence during physical training and field exercises. This article reports on two studies of active duty female soldiers with stress-induced urinary incontinence. The first study showed the effectiveness of pelvic floor muscle exercise sessions, assisted by surface electromyography (EMG) biofeedback, supplemented by home muscle strengthening exercises. Mastery of muscular control correlated highly with symptom reduction and cystometric normalization. The second study documented the effectiveness of ambulatory urodynamic monitoring and again showed the effectiveness of surface EMG training for stress-induced urinary incontinence.

Prevalence

Urinary incontinence is frequently thought of as occurring mostly among women who have had several children; complications from pelvic floor surgeries; and the elderly with poor muscle strength, tone, and coordination. The prevalence of urinary incontinence among elderly women is well documented. The National Institutes of Health and U.S. Department of Health and Human Services stated that approximately 15%–30% of women over the age of 60 and up to 50% of nursing home residents are affected by this condition.

However, this problem is not restricted to elderly or multiparous women. Rather, a significant number of young, nulliparous females also report urinary loss. Bo, Stein, Kulseng-Hanssen, and Kristofferson (1994) conducted a study on first-year physical education students and found that 13 out of the 37 subjects (38%) had some degree of stress urinary incontinence. Bo et al. (1994) stated they had previously found 26% of young, nulliparous, physically fit women to have stress urinary incontinence. Nygaard (1995) stated that about one third of female exercisers develop this condition. Cutler, Friedmann, Felmet, and Genovese-Stone (1992),

in a study on the prevalence of stress urinary incontinence among healthy women, found that >50% of the 194 women that he surveyed acknowledged having problems with involuntary loss of urine. Military studies conducted in both the Denver and Seattle areas (Sherman, Davis, & Wong, 1997) found that one third of 450 female soldiers surveyed indicated that they experienced problematic urinary incontinence during exercise and field training activities. The surveys were of all female soldiers stationed in the areas, so this probably gives a better indication of actual prevalence than studies counting only those women reporting the problem to their health care providers. The other crucial finding of this survey was that 13.3% of the respondents restricted fluids significantly while participating in field exercises. Although only 5.3% of respondents felt that their urine leakage had a significant impact on their regular duties, it is obvious that many more are sufficiently worried about leakage to put themselves at significant risk for dehydration-related injuries. These results have been confirmed by a survey conducted as part of recruiting subjects for the interventional studies reported below.

Because this condition is often embarrassing to the patient, many do not report their symptoms and urinary incontinence remains under-diagnosed. It often causes women to stop exercising or to change the type of exercise in which they engage.

Behavioral Interventions

Two studies were conducted that evaluated the effectiveness of behavioral interventions for physical stress-induced urinary incontinence among healthy young women. The studies took place at several military medical facilities in the Denver and Seattle areas. Team members included the author (Orthopedics Service), Garry Davis (OB-GYN), Melissa Wong (Clinical Investigation), and Lorie Loan (Nursing Research).

In the first study, Sherman et al. (1997) tested 39 female soldiers reporting exercise-induced urinary

incontinence. Their medical records were checked to ensure that they had no significant health problems. They underwent a standard evaluation of the lower urinary tract, which included a detailed urogynecologic history, genitourinary physical, and neurologic examination. The genitourinary physical involved a pelvic examination to assess pelvic support and muscle tone. The subjects were then classified according to criteria specified by the International Continence Society. Seventy-seven percent of the subjects had stress incontinence only, and 23% had mixed urinary incontinence (stress and urge). All subjects underwent urodynamic assessments of bladder capacity, urethral closure pressure, and detrusor contraction pressures. A pre- and posttreatment symptom questionnaire was filled out and a symptom log maintained by all subjects throughout participation in the study. They were randomized into two groups. Twenty-three participants (Group A) were taught and practiced pelvic muscle exercises assisted by vaginal and abdominal surface electromyography (SEMG) biofeedback for eight sessions over an 8-week period. Sixteen women (Group B) performed pelvic floor muscle exercises without biofeedback except during an initial SEMG baseline recording. Both groups performed pelvic muscle exercises several times per day as confirmed by a log kept by each subject.

The biofeedback group (Group A) received exercise training sessions assisted by two SEMG channels, one from the right abdominal oblique muscles and the other from the pelvic floor muscles via a self-inserted vaginal SEMG sensor. They received 20-minute treatment sessions once per week over an 8-week period. Subjects were training to produce both short and sustained isolated pelvic floor muscle contractions (10-second holds to about two thirds of maximum contraction). They were asked to focus on keeping the abdominal oblique tracing low as they performed the pelvic muscle exercises and to rapidly release back down to baseline following contractions. Subjects were also trained to rapidly tense their pelvic floor muscles to nearly maximum levels of tension ("quick flicks") and to rapidly relax. At each visit the therapist evaluated the participants' ability to perform these tasks while viewing and not viewing the biofeedback display. Details of the protocols can be found in Sherman et al. (1997).

Members of Group B received actual biofeedback only during the first session. When asked to produce isolated pelvic floor muscle contractions, they were alerted to any co-contraction of the abdominal obliques and

allowed to view the biofeedback display screen once for <2 minutes. This group came to the clinic for weekly SEMG recordings taken while they practiced their exercise program, unassisted by biofeedback. They received the same exercise instruction as Group A. The SEMG recordings provided an accurate assessment of changes in pelvic floor and abdominal oblique muscle activity. Virtually every subject in Group B altered her motor patterns at least minimally during that single display in Session 1 and also reported improved sensory awareness of her motor responses.

Patients' reports as well as the posttreatment examinations indicated that all subjects improved significantly. Only five subjects in the biofeedback/exercise and three in the exercise-only group desired further treatment after 8 weeks. There was a high correlation between the ability to selectively contract the pelvic floor and symptom improvement. All subjects initially diagnosed with detrusor overactivity had normal readings at the end of the study. It is important to note that both groups received biofeedback. Apparently, subjects in the brief single biofeedback session group received sufficient new and accurate information that they were able to effectively exercise their pelvic floor muscles. Additionally, Group B subjects' knowledge and sensory awareness that their pelvic muscles were being monitored during training sessions might explain why this group did well with exercise alone when clinical experience widely indicates that pelvic floor muscle exercises alone are *often* ineffective for this age group. Further details of the results can be found in Sherman et al. (1997).

The second study (Davis et al., 1998; Wong, Sherman, & Davis, 1997) compared ambulatory/workplace recordings of urodynamic functioning with those made in the clinic. It found that (a) in-clinic recordings are less able to detect problems occurring in the field than ambulatory recordings made in the work or duty setting, and (b) abnormal readings normalize with successful behavioral intervention. Fifty active duty female soldiers with exercise-induced urinary incontinence and 10 asymptomatic controls underwent conventional, in-clinic, multichannel cystometry and then ambulatory monitoring with a system capable of making the same measurements during work and/or exercise.

Urodynamic evaluations were performed using a special urodynamic system (1711 UROFLOW, Life-Tech, Stafford, TX), which has the capability to record abdominal, vesical, urethral, and detrusor pressures. The system is additionally able to perform uroflometry with postvoid

residual urine volume measurement, retrograde provocative water cystometry, resting and stressed urethral axis determination, and direct visualization testing for fluid loss with stress. Subjects also received weekly muscle biofeedback sessions. Vaginal EMG sensors recorded muscle activity from the pelvic floor muscles, while additional adhesive sensors were attached to the abdomen to measure abdominal EMG activity. Training was similar to that described for the first study. Home SEMG training units were given to patients in the biofeedback group for the first week of their treatment.

Ambulatory monitoring detected abnormalities among 96% of the subjects, whereas conventional multichannel urodynamic studies only showed abnormalities among 18%.

Assuming the accuracy of the ambulatory measures, this study more closely correlates the urinary incontinence with specific urodynamic problems. This greater diagnostic sensitivity is valuable in formulating more effective treatment. The biofeedback interventions were also effective in reducing reported urinary incontinence and in reducing the majority of the abnormalities in the urodynamic monitoring. Only those soldiers with symptomatic improvement showed the cystometric improvements. Additional details of the study and its results can be found in Davis et al. (1998).

Discussion

The studies reported above have shown that biofeedback training is efficacious for stress and urge urinary incontinence among relatively young, otherwise healthy female soldiers in excellent physical shape. Training can be performed near the soldiers' workplaces, minimizing loss of work time. There are no side effects as found with pharmacological interventions. Thus, although long-term follow-up studies of behavioral interventions for urinary incontinence have not yet been performed in this population, the research to date supports the use of behavioral techniques as first-line interventions prior to pharmacological interventions.

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