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# DEVELOPMENT OF A PAD TEST TO ASSESS STRESS URINARY INCONTINENCE IN YOUNG, HEALTHY WOMEN: A PILOT STUDY

## Hypothesis / aims of study
Stress urinary incontinence (SUI) in young, nulliparous women was first described in the literature in 1954, with 52.4% of those surveyed reporting incontinence (1). Current literature reports that between 7 and 14% of young, healthy women have SUI, with the incidence rising to 19-31% in the military and up to 49% in college age athletes.

Although SUI is prevalent in young, healthy women, the pad tests that have been reported in the literature have been developed for and tested in the older, parous population. Our preliminary study based on pad tests from two research studies that included women under the age of 30 (2,3), revealed that these tests were not provocative enough to elicit urine loss in young, nulliparous women with SUI (unpublished). In order to adequately quantify SUI in women between the ages of 18 and 30 years, a new test is required.

Given the incidence of SUI in young women, it is essential for the researcher and clinician to have methods to objectively measure urine loss in this population to effectively manage the condition. The purpose of this pilot study was to determine the reliability of a new pad test designed specifically to assess urine leakage in young, healthy women with SUI.

## Study design, materials and methods
This was a within-group, observational study of a convenience sample of healthy women between the ages of 18 and 30 years. Recruitment occurred through advertising at a local university campus.

One hour prior to testing, participants were asked to drink one litre of water and not to empty their bladders until after the pad test was complete. A pre-weighed incontinence pad was given to the individual to wear during the testing procedure. Each woman was instructed to perform the activities as hard as she could and not to attempt to prevent urinary leakage, either by slowing or stopping the activity, or by squeezing her pelvic floor muscles. However, if the participant needed to rest between activities, she was permitted to do so.

For a warm-up, the volunteer walked up and down 40 steps at her own pace. The pad test started with running up and down 40 steps twice, taking approximately one minute; and then completing 1-minute intervals of the following activities: standing up from sitting, sit-ups, running on the spot, jumping jacks, and jumping on a small exercise trampoline. The participants were given standardised encouragement at 30 and 50 seconds for each of the timed activities. The test ended with 10 hard coughs, performed at the individual's own pace. Overall, the test required approximately 10 minutes to complete. Finally, the presence and severity of incontinence was evaluated by re-weighing the pad. Testing was performed at the same time of day on two consecutive days.

A repeated measures ANOVA was used to evaluate differences between the groups and the testing sessions. The model included continence status and the testing session as fixed factors and the participant as a random factor. The interaction between continence status and testing session was included in the model.

Based on the ANOVA, the intraclass correlation coefficient (ICC) was computed, to estimate how closely the data from each participant matched from day one to day two. Specifically, we used the $ICC_{2,1}$ model. By adopting this model we are saying that the testing framework (two consecutive days) is assumed to be only one of many possible ways the test-retest reliability could have been assessed. Finally, the standard error of measurement (SEM), an absolute reliability index that indicates the extent to which a score varies on repeated measurement, was calculated. The SEM allows the construction of confidence intervals for individual test scores.

## Results
Thirteen nulliparous women aged 22 to 29 years (mean: 25.92, ±1.89) with a mean body mass index (BMI) of 21.69 kg/m$^2$ (±1.88) participated in the study. There were no dropouts and all participants completed the testing without incident. Seven of the volunteers were continent and six had SUI. Seven women (3 with SUI; 4 controls) were using hormonal contraceptives.

In the ANOVA, the interaction between continence status and testing session was not significant (p= 0.121), nor were either of the main effects (continence status p= 0.084 and testing time p= 0.101). Therefore, we simplified the model by removing testing time and continence status became significant (p= 0.032). The mean increase in pad weight was 0.64 g (± 0.50) for the continent group, and 9.92 g (± 13.05) for the SUI group. However, the test was unable to elicit measureable urine loss in two volunteers with SUI, resulting in two false negatives. The $ICC_{2,1}$ outcome was calculated at 0.92 and the SEM was 2.81 g.

## Interpretation of results
The purpose of this study was to determine the reliability of a new pad test designed to evaluate SUI in young, healthy women.

It can be difficult to provoke urinary leakage in healthy young women, despite self-reports of SUI. This challenge is likely because they have experienced little damage to their pelvic floors, such as through parity and elevated BMIs, and that their leakage is usually triggered by relatively intense activities. However, the results of this study support the use of this pad test in healthy young women with SUI and suggest that it is challenging enough to cause significant urine loss in the majority.

In the control group, pad weight did not increase more than 1 g. This suggests that, under indoor, climate-controlled conditions, the test does not stimulate measureable vaginal secretions or perspiration. Furthermore, it suggests that any pad weight gain of greater than 1 g can be interpreted as quantifiable incontinence.

The two false negatives do not necessarily indicate that the participants did not leak at all, rather that their leakage was less than 1 g. This amount of SUI might still be bothersome, but would not be enough to be quantified with this test. Further research is necessary to develop methods for measuring small, but bothersome, amounts of leakage.

The results of the $ICC_{2,1}$ indicate that this test provokes similar amounts of urine loss on two consecutive testing days, which suggests that this test may be appropriate for investigating temporal fluctuations in SUI symptoms. Based upon the SEM, any change in leakage greater than 3 g should be considered to be a real change.

Concluding message
This pad test is a simple test that can be used to quantify urine loss in healthy women between the ages of 18 and 30 years with SUI. It has good test-retest reliability and is sensitive enough to detect urine loss in nulliparous women with a low BMI.

References
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