

The impact of bladder sensation on gait in continent and incontinent community-dwelling women fallers

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CONTEXT

- Urinary incontinence (UI) affects **25% to 45%** women¹
- 1/3 elderly** over 65 years old **fall** once a year²

Fall rate in urgency UI (UII) (urine leakage related to urgent desire to void) and mixed UI (MUI) (urine leakage related to effort and urgent desire to void) in elderly women is higher than continent. 29% vs 20%³

Does *strong desire to void (SDV)* alter gait parameters and increase risk of falling ?

AIMS OF STUDY

Primary objective:

Investigate the effect of a **strong desire to void** on gait parameters in urgency/mixed incontinent and **continent** community-dwelling women who are **at risk of falls**.

Secondary objective:

Determine the **relationship between urinary incontinence severity and gait** parameters in the group of **incontinent** women.

DESIGN/POPULATION

Design: Cross-sectional observational pilot cohort study

Population: women ≥ 65 years old, living in community

***At least 1 fall in last year**

- 2 groups:**
- Continent
 - Mixed/urgency urinary incontinent women

Inclusion/exclusion (for all)

- BMI < 35
- No medical condition or medication affecting gait or continence
- No surgery or treatment for UI or gait in last year

Continent group

- No urine leakage in last year**
- ICIQ-UI SF=0 (*International Consultation on Incontinence Questionnaire on UI Short Form*)
- No urine leakage in 7 day bladder diary

Incontinent group

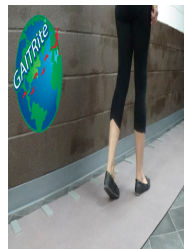
- Moderate to severe MUI or UII**
- ICIQ-UI SF $\geq 6^4$
- 3 urine leakage a week** (1 and + related to urgency) in 7 day bladder diary

METHOD

- 3 hour gait laboratory assessment
- Gait assessment on gait analysis mat (GAITRite®).

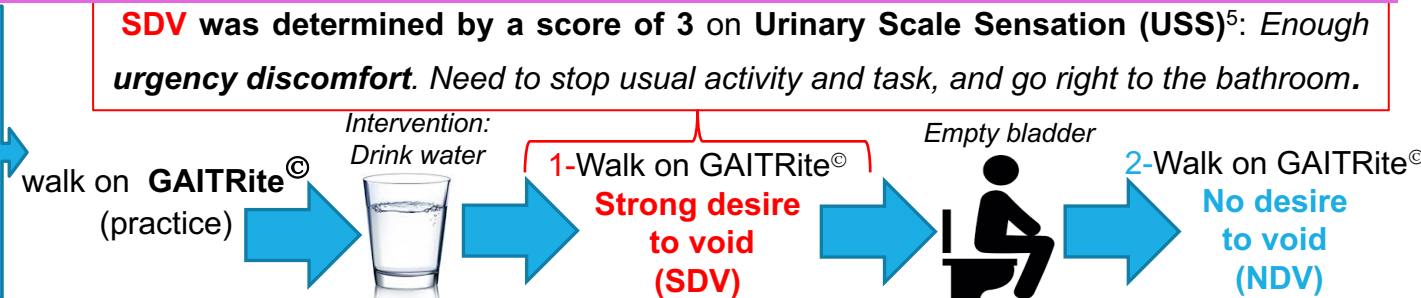
In 2 conditions:

- Strong desire to void (SDV)**
- No desire to void (NDV)**



Before laboratory assessment
-7 day bladder diary
-24 hour pad test

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OUTCOMES

Continence status/severity⁴



ICIQ-SF⁴⁻⁵:

Evaluates 4 domains in the form of 4 questions:
 -the frequency of the UI (0 to 5)
 -the perceived quantity of leakage (0 to 6)
 -the impact of UI in everyday life (VAS 0 to 10)
 -the cause of leakage

7 day bladder diary⁶:

Measurement tool to assess the number of urine leakage (symptom severity) and type of urinary leakage in 7 days.

24 hour pad test⁷:

Measures the amount of urinary leakage in a pre-weighted protective pad for 24 hour, during which, participants continue usual activities. Positive if weight >4g in 24hr.

Gait parameters² (GAITRite[®] results)

- Velocity (cm/sec)
 - Stride width (cm)
 - Stride length (cm)
 - Stance time (sec) (unipodal stance time)
 - Variability of each parameter(%) (Standard deviation/mean X100)
- *according to literature review those gait parameters are determinant of falls.³*



Demographics

- Age
 - Body mass index (BMI)
 - Montreal Cognitive assessment test (MOCA)¹
- Normal score ≥ 26*
- History of falls

RESULTS: Demographics & continence status/severity

	Continent (n=17)	Incontinent (n=15)	p
Age (years) ^b	74.6 (4.1)	73.5 (5.9)	0.53
BMI (kg/m ²) ^b	24.6 (3.0)	28.3 (4.8)	<0.01*
MOCA (/30) ^b	27 (3)	28 (2)	1.00
Nb. Falls in the last year (%) ^c :			0.03*
1	70.6	33.3	
2	29.4	40.0	
3 and +	0	26.7	
ICIQ-SF UI (/21) ^d	0 (0)	12 (3)	<0.01*
Pad test 24 hour (g) ^d	0.6 (0.5)	9.3 (10.8)	0.04*
Nb. Urine leakage/day (mean) ^d	0 (0)	11 (8)	<0.01*

* : significant $p < 0.05$, b: t-test, c: Chi-square, d: Mann-Withney

STATISTICAL ANALYSIS

Primary objective:

We analysed and compared gait parameters for the two groups (continent/incontinent) for the two conditions (SDV/NDV) using:

- **ANOVA** (parametric gait parameters outcomes)
- **Kruskall-Wallis** (non-parametric gait parameters outcomes)

Secondary objective:

- **Spearman correlation** (r_s) between ICIQ-SF and gait parameters

$p < 0.05$ was considered significant

BMI was different between groups it was included in analysis as:

ANOVA

(parametric outcomes):

BMI (≥ 25 / < 25)

included as a covariate

Kruskall-wallis

(non-parametric outcomes):

4 groups:

- Incontinent BMI ≥ 25
- Incontinent BMI < 25
- Continent BMI ≥ 25
- Continent BMI < 25



RESULTS primary objective: GAIT parameters

No group or interaction effect

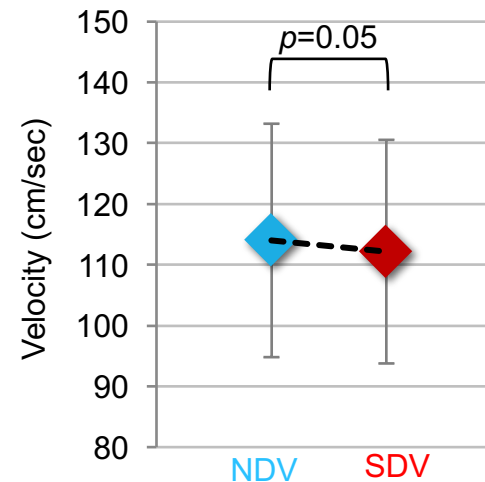
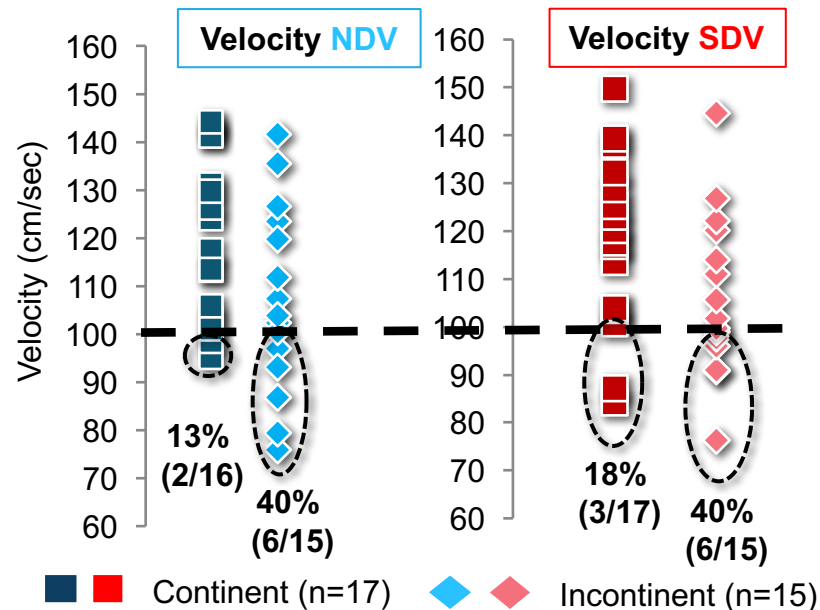
ANOVA Gait parameters results

	Continent		Incontinent		No group or interaction effect			
	NDV n=16	SDV n=17	NDV n=15	SDV n=15	Interaction effect F; p	Group effect F; p	Condition effect F; p	Effect size (η^2)
Velocity (cm/sec)	120 (17)	118 (18)	107 (20)	106 (17)	1.63; 0.21	1.46; 0.24	4.06; 0.05	Large (0.13)
Stride width (cm)	10.5 (2.0)	9.9 (2.5)	10.9 (2.5)	10.8 (2.6)	0.76; 0.39	0.00; 0.95	5.74; 0.02*	Large (0.18)
Stride length (cm)	127.4 (12.9)	126.3 (12.7)	114.5 (16.9)	114.2 (15.0)	0.82; 0.37	1.94; 0.18	1.95; 0.17	Moderate (0.07)
Stance time (sec)	0.67 (0.07)	0.69 (0.10)	0.69 (0.06)	0.69 (0.06)	2.08; 0.16	0.09; 0.76	3.75; 0.06	Moderate (0.12)

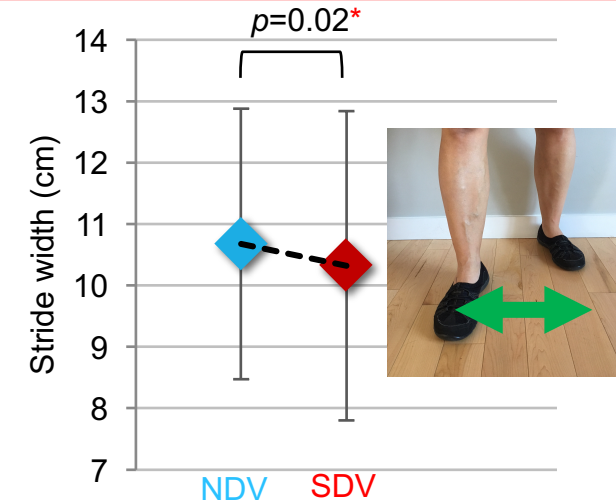
1- Clinically slower walking velocity in incontinent (<100cm/sec=increased risk of falls¹)

2- Reduced velocity in both groups when experiencing **SDV**

3- Reduced stride width in both groups when experiencing **SDV**



Difference between NDV & SDV (both groups)



Gait variability (Kruskal-wallis results): no difference between groups and conditions



RESULTS secondary objective: Correlations ICIQ-UI SF & GAIT parameters

More severe urinary incontinence (UI)
was strongly correlated:



In no desire to void (NDV):

- **Reduced velocity**
(r_s : -0.63; $p=0.01$)
- **Increased stance time**
(r_s : 0.65; $p=0.01$)
- **Increased stance time variability**
(r_s : 0.65; $p=0.01$)

In strong desire to void (SDV):

- **Reduced velocity**
(r_s : -0.56; $p=0.03$)
- **Increased stride length variability**
(r_s : 0.54; $p=0.04$)

CONCLUSION

Primary objective:

- No group & interaction effect
 - Clinically slower velocity in incontinent group
- In **SDV** we observed in both groups:
- **Reduced velocity**
 - **Reduced stride width**



Secondary objective:

Incontinent severity was correlated in both conditions to:

- **Slower gait parameters**
- **Increased gait variability**

When you add those results together, incontinent women, when experiencing a SDV reduce their already slower gait when going to the bathroom.

As increased variability and slower velocity are known to be related to an higher risk of falls¹, women with severe incontinence could be even more at risk of falls.

Women with severe incontinence could be even more at risk of falls

It could be **relevant in clinic to question about fall history**, especially women suffering from moderate to severe urgency or mixed UI.

More studies are needed to confirm these results and to further understand falls in an incontinent population.

