

## IMPAIRED EXECUTIVE FUNCTION IS ASSOCIATED WITH MIXED URINARY INCONTINENCE IN OLDER, COMMUNITY-DWELLING WOMEN.

### Hypothesis / aims of study

The association between cognition and urinary incontinence (UI) in older, community-dwelling women remains understudied; among the few studies that have been undertaken, some support a significant relationship between cognitive decline and UI, and others do not.<sup>(1)</sup> However, these divergent results may be due to the use of indexes of global mental functioning (such as, the Mini-Mental State Examination (MMSE)) that are too general, hence not specific enough to measure the dissociation between the cognitive domains or functions. Furthermore, to our knowledge, no study has specifically assessed the relationship between UI and the executive function, an important aspect of cognition that relies on a subset of intentional control mechanisms (i.e.; selection, planning, inhibition and divided attention) by which we control higher cognitive functions (memory, problem solving, etc.) – these latter are also associated with reduced mobility and an increased risk of falls, and may also be important in maintaining continence. Given the prevalence of mixed UI in older women and its impact on their quality of life, understanding the potential role of executive-function decline within this complex syndrome could lead to significant improvements in prevention and therapeutic approaches. Therefore, this study aimed to characterize executive function in continent and mixed UI community-dwelling older women in order to identify associations between cognition and the presence of mixed UI.

### Study design, materials and methods

This report is a cohort study nested within a larger prospective quasi-experimental pre-post cohort study on aging women. Women aged 60 years and older, with and without mixed UI, were recruited through five continence clinics and newspaper ads or posters. Continence was defined as *the absence of any involuntary leakage of urine in the past 12 months*, and was verified using the Urogenital Distress Inventory (UDI) questionnaire.<sup>(2)</sup> Mixed UI was established by the UDI (leakage episodes on effort, exertion, sneezing or coughing, in addition to leakage related to urgency). To be included in the study, women had to be living in the community, ambulatory, and be either continent or describe a pattern of mixed UI (as defined above) that included urinary leakage at least once a week during the preceding three months. Women were excluded if they had other types of UI, demonstrated dementia (MMSE < 26), presented any acute or chronic medical conditions, or took medications that could have interfered with the study. After giving consent, the women participated in a 3-hour standard assessment with trained evaluators. Evaluation included an assessment of the presence of mixed UI using the UDI. The cognitive function assessment was comprised of: the MMSE for general mental health, the Similarities WAIS-II for general cognitive abilities and verbal abstraction, the Empan (forwards and backwards) WAIS-III for short-term and working memories, the Symbol Substitution WAIS-III for psychomotor speed, Trail-Making tests A and B, the Stroop test for executive function, and, finally, a computerized dual-task performance for divided attention.<sup>(3)</sup> A one-way between-groups ANOVA was used to explore the differences in cognitive performances between continent and mixed UI women.

### Results

115 women participated in the study - 32 were continent and 83 had mixed UI. Table 1 presents epidemiological and executive function characteristics of the subjects. Both groups were similar in terms of age and level of attained education ( $p > 0.05$ ). Women with mixed UI obtained lower scores on the Similarities subtest:  $F(1, 113) = 4.50, p < 0.05$ . They took more time to complete the flexibility condition of the Stroop test:  $F(1, 111) = 7.83, p < 0.01$ .

Table 1: demographic and executive function characteristics of continent and MUI subjects

		<b>MUI (N=83)</b>		<b>Continent N=32)</b>	
		Mean	SD	Mean	SD
<b>DEMOGRAPHICS</b>	Age(years)	68,36	6,42	66,88	5,90
	Level of education*	3,12	0,92	3,44	0,76
<b>EXECUTIVE FUNCTION</b>					
<b>Mental</b>	MMSE (score)	28,76	1,07	29,06	1,08
<b>Abstraction</b>	Similarity (WAIS-III) (score)	21,64	5,65	4,13	5,60
<b>Short-term and working memory</b>	Digit span forward (score)	9,49	2,30	9,03	2,24
	Digit span backward (score)	6,31	2,34	6,25	1,69
<b>Processing speed</b>	Digit coding (score)	62,59	17,2	62,91	11,57
<b>Attention and executive functions</b>	Stroop-word (ms)	43,05	7,32	40,95	5,02
	Stroop-color (ms)	66,39	13,86	64,53	12,23
	Stroop-interference (ms)	127,6	34,20	115,9	27,44

<b>Dual-task</b>	Stroop-flexibility (ms)	144,33	34,03	126,04	22,84
	Stroop-word (errors)	0,21	0,49	0,21	0,61
	Stroop-color (errors)	1,34	1,70	1,31	2,03
	Stroop-interference (errors)	2,73	2,91	2,09	3,14
	Stroop-flexibility (errors)	4,98	4,94	2,63	2,15
	Trail A (ms)	40,57	13,93	34,24	8,58
	Trail B (ms)	97,35	39,48	81,22	25,96
	Single-pure trials (ms)	754,30	189,80	714,39	129,68
	Single-mixed trials (ms)	1245,37	317,93	1142,17	193,30
	Dual-mixed trials (ms)	1944,16	505,98	1744,74	315,49
	Single-pure trials (% Acc)	96,61	1,39	97,85	1,24
	Single-mixed trials (% Acc)	98,65	1,45	99,14	1,39
		Dual-mixed trials (% Acc)	95,81	2,82	97,46

\* 1= primary school; 2 = secondary school; 3 = CEGEP and 4 = University

Further, they made significantly more errors in the flexibility condition of the Stroop test:  $F(1, 111)= 6.70, p < 0.05$ . Women with mixed UI also took more time to complete the Trail B test:  $F(1,112)= 4.44, p < 0.01$  and, they made significantly more errors in this test:  $F(1,112)= 5.84, p < 0.05$ . Finally, on the computerized dual-task test, mixed UI women showed longer reaction times in the dual-mixed trials:  $F(1,108)= 3.94, p < 0.05$  and, they made significantly more errors than the continent women in the dual-mixed trials:  $F(1,108)= 4.38, p < 0.05$ . The actual difference in reaction times mean scores between groups was 499.5 ms. The effect size, calculated using the eta squared was .04.

#### Interpretation of results

Compared to the continent women, those with mixed UI demonstrated poorer cognitive performance, especially on the executive function and divided attention tests. These results are novel in that they suggest that executive control deficits, such as difficulties in disengaging attention from one task to perform another or in coping with interference, are associated with the presence of mixed UI. The results of this study do not, however, indicate whether or not the relationship between executive function and the presence of mixed UI are causal.

#### Concluding message

This study is original in that it is the first to suggest that executive-control deficit is associated with UI presence in community-dwelling older women. Future studies are required in order to better understand their precise relationship, the findings of which could have a direct impact on the choice and method of UI treatment delivery.

#### References

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<b>What were the subjects in the study?</b>	<b>HUMAN</b>
<b>Was this study approved by an ethics committee?</b>	<b>Yes</b>
<b>Specify Name of Ethics Committee</b>	<b>Comité mixte d'éthique de la recherche, Regroupement Neuroimagerie Québec</b>
<b>Was the Declaration of Helsinki followed?</b>	<b>Yes</b>
<b>Was informed consent obtained from the patients?</b>	<b>Yes</b>