Time to be Ready to Void: A new tool to assess the time needed to perform micturition for patients with multiple sclerosis

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Abstract

Background. Urgency urinary incontinence is one of the major disabling urinary symptoms in people with multiple sclerosis (PwMS). The warning time (time from first sensation of urgency to voiding or incontinence) only partially reflects the possibility of continence. Other factors such as mobility, difficulties in transfer or undressing can influence this time.

Objectives. The aim was to create a specific test for PwMS to assess the global time required to be ready to perform micturition and to assess its reliability.

Methods. The Time to be Ready to Void (TRV) was based on 2 timed steps: "mobility" stage, including standing up and walking 6 m to the toilet, and the "settled" stage, starting as soon as the individual opens the toilet door until readiness for micturition. All participants performed the TRV twice. Reliability were assessed by the intraclass correlation coefficient (ICC) and convergent validity by Spearman correlation coefficient.

Results. We included 71 PwMS (mean [SD] age 54.4 [11.7] years). Inter-rater reliability was excellent for the TRV mobility stage (ICC 0.97), settled stage (ICC 0.99) and total test (ICC 0.99). Test–retest reliability was good for the mobility stage (ICC 0.88) and total test (ICC 0.81) and moderate for the settled stage (ICC 0.65). Test–retest reliability assessed by a Likert-type scale was good for each stage (κ 0.75 and 0.88). The mobility stage was correlated with the scores for the Timed Up and Go test, 10-Meter Walk Test, and Tinetti Mobility Test ($\rho = 0.89$; $\rho = 0.88$; $\rho = -0.67$, respectively; $p<0.0001$) and the settled stage with scores for the Tinetti Mobility Test, Functional Independence Measure and Nine Hold Peg test (right) ($\rho = -0.48$; $\rho = -0.36$; $\rho = 0.31$, respectively; $p<0.01$). Comprehension, acceptance and relevance were rated good by most participants (97%, 95% and 90%, respectively).

Conclusion. The TRV is a new tool to measure the global time needed to be ready to achieve micturition in PwMS. It seems useful in clinical practice for overactive bladder in addition to the classical warning time because it takes into account all the time needed to accomplish micturition (mobility, undressing, installation).

Keywords. multiple sclerosis; overactive bladder; urinary incontinence, urge; task performance and analysis

Introduction

Lower urinary tract symptoms (LUTSs) are frequent in central nervous system disorders, especially in people with multiple sclerosis (PwMS). The prevalence of LUTSs is high (32–96.8%) and increases with MS duration and severity of neurological deficiencies and disabilities[1]. Overactive bladder with urgency, frequency, and urgency urinary incontinence is the most common symptom, reported by 37% to 99% of PwMS. Overactive bladder affects

quality of life, and an overactive detrusor associated with detrusor sphincter dyssynergia can lead to an altered upper urinary tract (reflux, dilatation, urinary tract infection)[2–6]. In the absence of risk factors, the treatment aims to improve comfort and quality of life. Anticholinergic drugs are usually the first-line treatment, but their frequent adverse effects (constipation, xerostomia, cognitive impairment) may affect compliance and adherence[7]. The risk-benefit balance of these prolonged prescriptions in PwMS should be taken into account and constantly reassessed.

Urinary urgency, evaluated in part by the warning time[8], only partially reflects the numerous and varied factors that can influence continence, such as the ability to anticipate and plan urination in relation to cognitive skills, patient mobility and rapid access to the toilet, autonomy or difficulty in transfer, speed of undressing, and positioning in the toilet in a correct and secure position, etc.

Although we can easily ask our patients about the warning time with urinary urgency (defined as the time from the first sensation of urgency to voiding or incontinence) and although specific symptom scores such as the Urinary Symptom Profile[9] or other scores can easily quantify this time, the global time required to go to the toilet and undress is much more difficult to quantify. No specific test is available. There are only global assessments of independence, focusing more on the issue of dressing than removing clothes, with a qualitative assessment [10]. However, the ratio of the warning time and the time required to go to the toilet and be ready to void probably plays a role in continence. Sensory or motor deficits of the lower limbs or balance disorders can affect walking and therefore the time to reach the toilet and to be installed in a secure position. Dexterity or balance disorders can affect the undressing phase and increase the time needed to be ready to void. Thus, in clinical practice, preventing urgent urinary incontinence in PwMS is based on increased warning time by use of anticholinergics, beta3 agonists, neuromodulation or botulinum toxin but also, and

sometimes principally, rehabilitation measures, assistance devices, and tailored clothes to improve the time needed to be ready to void and thus possibly improve continence.

The aim of the study was to create a specific test to assess the global time required to be ready to void from the moment the person with MS initiates the action of going to the toilet, which includes standing up, moving to the toilet and removing clothes and installing themselves in a right and secure position, and to assess its inter-rater and test–retest reliability.

Methods

Study design

This study was approved by the local ethics review board (RCB: 2018-A01644-51) and all participants provided written informed consent before inclusion in this observational study. This study was registered on ClinicalTrials.gov (NCT04024085). Participants were recruited in a neuro-urology department during a medical appointment or a urodynamic assessment or a day hospital related to urinary disorders.

Participants

Inclusion criteria were age ≥ 18 years with an MS diagnosis, able to walk 50 m without human help, and Expanded Disability Status Scale (EDSS) score < 7. Exclusion criteria were relapse of MS in the last 7 days and acute urinary tract infection. Participants were recruited between March 13, 2019 and May 28, 2019.

Creation of Time to be Ready to Void (TRV) test

All steps to go to the toilet were discussed and approved by expert consensus with various health professionals (7 experts in neurourology and physical medicine and rehabilitation, 3 nurses with large experience in neurourology, 1 occupational therapist). The different stages

reported before voiding were standing up from a chair, walking to the toilet, opening the toilet door, entering the toilet, turning on the light, closing the door, getting close to the toilet, getting undressed, and sitting down if necessary.

The TRV was constructed based on these different steps. The patients had to stand up from a chair with armrests, walk 6 m to the toilet, open the door and turn on the light, close the door, undress and position themselves to urinate (Fig. 1). The distance of 6 m was chosen to be sufficient to evaluate the ambulation but not too great to limit the impact of possible architectural constraints during the evaluation.

Two major steps were defined. The "mobility" stage, starting when the examiner gives the starting signal, included standing up, walking to the toilet, and stopping when putting the hand on the door handle. The "settled" stage starts as soon as the individual has a hand on the door handle to being undressed and in the usual and secure position to void. The "interval" or "lap" function of the chronometer was used to facilitate the recording. The difficulty of each stage was assessed on a 4-point Likert scale, with 0 indicating impossible or need human help and 3 no difficulty. If the participant performed clean intermittent self-catheterization, the equipment was placed next to the toilet before the test.

The test was designed to be rated by a physician or paramedical staff and performed during a medical appointment. Details of clothing worn on the day of the test were noted, including the presence of buttons, a belt, pants or skirt, pantyhose, or a diaper. The use of a walking aid for the TRV was noted.

Procedures

Medical history and descriptive data were collected. Urinary symptoms were assessed by the Urinary Symptom Profile questionnaire with 3 aspects: stress urinary incontinence (/9), overactive bladder (/21) and low stream (/9) [9]. Data for the last urodynamics were collected,

especially the presence of detrusor overactivity. MS severity was assessed by the EDSS, which measures impairment in 8 functional systems, and on walking ability[11]. Missing data were not replaced.

The test was explained to participants before they performed the TRV. Patients were asked to assess their need to void on a numerical scale between 0 and 10.

To assess inter-rater reliability, 2 examiners recorded the first TRV try with a digital chronometer. To assess the reliability of the TRV, a second test was attempted after at least 10 min of rest, with one of the 2 examiners, checking that the need to void had not changed significantly. Reliability was evaluated the same day to limit the impact of the day's clothing.

To assess the convergent validity of the TRV, further tests were carried out: a 10-m walk test (10MWT)[12] at maximum speed and a Timed Up and Go (TUG) test[13] to assess the ambulation function; a bilateral Nine Hold Peg (NHP) Test for dexterity[14]; a Tinetti Mobility Test (TMT; direct quotation during the test procedure) [15] and the self-reporting questionnaire Fall Efficacy Scale International for balance evaluation[16]; the Functional Independence Measure (FIM) score[17]; and the Katz - activities of daily living index (Katz ADL)[18]. The Katz ADL was used because it includes a specific question on difficulties going to the toilet (go to the toilet, arrange clothes, clean genital area). The NHP test was not interpreted in terms of laterality in view of the two-handed nature of the tasks to be performed. The sum of the 2 NHP tests was calculated to assess the correlation with settled stage (a low score corresponding to the absence of deficit on both the right and left, a high score reflecting a two-hand deficit or a severe unilateral deficit). Convergent validity was expected between the mobility stage and the 10MWT, TUG and EDSS scores and between the settled stage and the Fall Efficacy Scale International, NHP and Katz ADL scores.

Divergent validity was expected between the mobility stage and the TMT score and between the settled stage and TMT and FIM scores.

Participant perception of the TRV

In a second step, PwMS were interviewed about understanding the instructions, acceptability of the test and relevance of this evaluation. These 3 parameters were assessed with a 3-point Likert scale. At the end of the instruction statement, the evaluator asked about understanding (good, moderate, poor). After the test, participants were asked about the acceptability of the test (good, moderate, poor) and its relevance in the context of MS and urinary disorders (good, moderate, poor).

Statistical analysis

Statistical analyses were performed with R for Windows (Rx64 3.4.2, R Foundation for Statistical Computing, Vienna, Austria). Descriptive data are presented as mean (SD) for continuous data and median [Q1–Q3] for ordinal data and data not normally distributed. The effect of the EDSS score on results of the TRV was measured with one-way ANOVA, by dividing patients into 3 classes (EDSS score < 4, 4–5.5, ≥ 6). Inter-rater and test–retest reliability was assessed with the intraclass correlation coefficient (ICC) for quantitative variables (absolute agreement). ICC values 0 to 0.5 were considered weak, ≥ 0.5 to 0.75 moderate, ≥ 0.75 to 0.9 good, and ≥ 0.9 excellent [19]. Absolute reliability was expressed as the standard error of measurement (SEM) and was calculated as SD $\times\sqrt{(1\text{-ICC})}$, where SD is the standard deviation of the calculation using all test scores from both the first and second sessions. The SEM was used to calculate the smallest real difference (SRD95%), using the equation SEM $\times \sqrt{2} \times 1.96$. The SRD is an estimation of the smallest real difference required to be 95% confident that an observed change in an individual score reflects a real change in

the underlying parameter. The SEM and SRD are presented as percentages of their respective means (SEM% and SRD%). The Bland-Altman plot provided visual interpretation, with the difference between the test and retest plotted against the mean of the 2 test sessions for each participant. For ordinal variables (difficulty assessed by the Likert scale), inter-rater reliability was assessed by percentage agreement, and test–retest reliability was assessed by the weighted kappa coefficient (κ). Convergent validity with the complementary tests was assessed by the Spearman correlation coefficient. $P < 0.05$ was considered statistically significant.

Results

Patient characteristics

We included 71 patients, with mean (SD) age 54.4 (11.7) years. The demographic characteristics of participants are in Table 1. The number of missing data in patient characteristics was less than 1%. Most patients (72%) performed the TRV without a walking device, 18% used a cane, and 10% used 2 canes or a walker. Risk of falls was considered high to very high according to the TMT (<24/28) in 69% of participants, including 59% who performed the test without a walking aid. Concerning urinary leakage, 45% reported urinary incontinence at home and 53% during outdoor outings. All patients performed the entire procedure, so no data were missing on the test results.

TRV results

The mean (SD) time for the TRV mobility stage was 10.76 (6.07) sec and 19.8 (9.01) sec for the settled stage. The mean TRV scores for the mobility stage ($p < 0.0001$) and difficulty for each stage differed by the EDSS score ($p< 0.0001$ for mobility stage, $p=0.02$ for settled stage) (Table 2).

Inter-rater reliability

Inter-rater reliability was excellent for the TRV mobility stage (ICC = 0.97), settled stage (ICC = 0.99) and total test (ICC = 0.99). Concerning difficulty assessed by the Likert scale, the inter-rater reliability was excellent for each stage (percentage of agreement at 94% and 95% respectively).

Test–retest reliability

The need to void was absent or low for most participants for both tests (mean [SD] 1.8 [2.3] for the first try, 1.4 [2.2] for the second try). Eleven patients voided at the end of the first test and only 4 of them had a need to void ≥ 5/10 during the first test. The mean need to void did not differ between the 2 tries ($p = 0.11$). Test–retest reliability was good for the mobility stage (ICC = 0.88) and total test (ICC = 0.81) and moderate for the settled stage (ICC = 0.65) (Table 3). The settled stage showed an improvement in time for 76% of patients in the second TRV try, whereas 76% of patients showed a variation of less than 1 sec over the mobility stage. All results are reported in Table 3, and Bland and Altman plots are in Figure 2. Concerning difficulty assessed by the Likert scale, the κ coefficient was 0.75 for the mobility stage and 0.88 for the settled stage.

Convergent validity

Scores for the 10MWT, TUG test, EDSS and TMT were correlated with the TRV mobility stage scores. Scores for the EDSS, TMT, Fall Efficacy Scale International, NHP test, FIM, and Katz ADL were correlated with settled stage scores (Table 4).

Participant perception

In all, 39 participants were asked about their perception of the new TRV tool. Understanding was good for most (97%) and moderate for 3%. All participants found the test acceptable (good acceptability 95%, moderate 5%). Concerning the relevance of the test, most rated it as good (90%); 7% considered the interest moderate and 3% poor.

Discussion

Urgency urinary incontinence is one of the major disabling urinary symptoms in PwMS. The warning time only partially reflects the possibility of continence. Here we created a specific test for PwMS to assess the global time required to be ready to perform micturition. The TRV was validated with 71 PwMS. Its inter-rater reliability was excellent for each stage and its test–retest reliability was good for the mobility stage and total test and moderate for the settled stage. The mobility stage is well correlated with walk assessment and disability, and the settled stage is correlated with balance and prehension assessment. Comprehension, acceptance and relevance were rated good by most participants.

The importance of the delay between the decision to urinate (which may follow an urgent need) and the realization of micturition depends on the occurrence of incontinence. Usually, in routine practice, a patient is asked how long he/she can delay micturition as soon as the first desire to void occurs, which defines the warning time[8]. This time reflects the possibilities of voluntary or reflex detrusor inhibition by the central nervous system control or by active contraction of the perineal muscles in the context of bladder inhibitor reflex with transient inhibition of the micturition reflex. This warning time can be improved with various treatments playing a role on the afferent pathways and/or motor efferent pathways including detrusor contraction[20,21]. Thus, anticholinergics drugs, beta3-adrenoceptor agonists,

botulinum toxin, tibial nerve stimulation, and sacral neuromodulation can be used to avoid urgency urinary incontinence and so improve quality of life of these patients.

However, this warning time does not exactly reflect the real delay needed to achieve micturition after perception of the desire to void because this time does not take in account global motor performances (sensory and motor disabilities, walking speed, difficulties in undressing and sitting in a right position, etc.). This complementary time needed to achieve micturition without incontinence is sometimes more important than the classical warning time and, obviously, not accessible to a treatment purely dedicated to overactive bladder and thus requires specific measures.

The TRV is the first validated tool for a quantitative assessment of the time required to go to the toilet to achieve micturition and a qualitative one on the difficulty of carrying out the different steps. It allows for evaluating the person's undressing, walking speed, and installation on the toilet, which does not exist in the available independence scales. We found excellent inter-rater reliability and good to moderate test–retest reliability, probably due to a learning effect on the second step.

Good correlations between the first TRV step, mobility, and the 10MWT or TUG results were expected because only a few functions are assessed during the mobility step (stand up, walk a few meters). Correlations were lower during the settled step because several functions are evaluated, and no combined test with balance, dexterity and independence exists. These lower correlations reflect the lack of assessments available for these activities of daily living and the interest of the TRV.

The strength of this tool is the possibility of having an objective measure of the time to go to the toilet and to be ready to achieve micturition. In PwMS, the correlation between subjective and objective measures of everyday life activities is not always good[22]. The only objective measure that could be used is the Assessment of Motor and Process Skills, but the choice of

the 2 daily tasks evaluated depends on the patient's priorities, requires specific training of the examiners and takes from 30 to 60 min[23]. In contrast, the TRV allows for a simple evaluation, without expensive equipment, with a short completion time. Another interest of the TRV is being able to evaluate patients in the situations most at risk of falling: transfer by standing up from a chair and sitting on the toilet if necessary, walking, and standing in a static position[24]. In PwMS, falls frequently occur inside the home[25], and when PwMS need to void, a distractive factor (the need to urinate) is potentially added to pre-existing difficulties. A link between urinary incontinence and risk of falling has been shown[26], and thus an objective evaluation of all the parameters involved is relevant.

The TRV allows for nuancing the need, or the failure, of anticholinergics prescribed for overactive bladder. To improve the needed time to achieve micturition and thus give time for the individual to be continent, it is sometimes not useful to choose another anticholinergic or escalade the different therapeutic strategies (anticholinergics, botulinum toxin, sacral neuromodulation) but simply to give advice for a better walking device (cane), propose adapted clothes to be quickly ready for the micturition, and prescribe physiotherapy to enhance motor and sensory possibilities. Thus, it seems important to consider the global time of the TRV but also to compare the 2 stages (mobility and settled) in order to better prescribe and adapt the specific treatments. In our study, the median EDSS score was 6, corresponding to the target population in which urinary disorders are frequent and for which the question of difficulties in accessing the toilet is relevant.

Some limitations of the study exist. First, the test was not performed during an urgent need to void, which could probably modify the results a little (distractibility, precipitation during the second step, etc.) but could be easier to use in everyday practice without waiting for an urgent need to void. Second, where the test is performed does not necessarily correspond to the person’s home and therefore the exact conditions of daily life. Nor is it representative of the

outside environment, where distances are often greater and where other factors may be involved (searching for toilets, outdoor temperature, psycho-behavioral factors, etc.). The clothing worn was not standardized. The objective of the TRV is to evaluate patients with their most usual clothing and possibly advise them on ways to reduce the time required to undress or for toilet installation. If the TRV is performed during follow-up, it will be essential to take into account the clothes worn on the day of each test, which are systematically noted in the evaluation.

Furthermore, to assess internal consistency, some tests are validated more often in older adults than in MS, but this is the case for most balance evaluations. The test–retest reliability was moderate for the settled stage, probably due to a learning effect (76% of participants improved their time at the second try), but the primary aim is to allow for a quantitative assessment and not necessarily to compare the performance regularly. A non-timed test to teach the instructions may have improved reproducibility, as is done for the TUG test. The standard error measurement (SEM%) was above the values accepted as ensuring good reliability. However, significant variability in gait tests of 12% to 38% has been shown in several studies of individuals with MS[27,28] and reliability of other functional tests is usually good to moderate[29]. Finally, the TRV does not take into account the cognitive aspect of continence. An assessment of executive function in case of urgency incontinence could be pertinent, because the ability to anticipate and plan urination reduces the risk of incontinence. However, these precautionary voids require the physiological possibility of triggering voiding without an urgent need to void, which can be affected by detrusor-sphincter dyssynergia in PwMS.

Perspectives

In evaluating neurological patients with LUTSs, the validation of this test in other populations would be relevant. For example, in Parkinson disease, overactive bladder is frequent, and the use of anticholinergic drugs is problematic because of frequent cognitive disorders and constipation[30]. Difficulties in reaching the toilets related to walking disorders, freezing, akinesia and risk of falls probably affect continence in these patients. A TRV appropriate for patients in wheelchairs could be of interest, but in PwMS, urinary disorders are often associated with risk for upper urinary tract complications with high EDSS score, and the treatment and care issues are different. To adapt the treatment, it will be necessary to evaluate in a large cohort the role of the "warning time/TRV" ratio on indoor and outdoor continence. Individuals may be classified according to this ratio and thus therapeutics modulated according to the different categories. The TRV, combined with an assessment of LUTS (specific questionnaire, clinical evaluation, urodynamics), allows for an overview of the factors related to urinary continence and offering comprehensive management, not just focusing on the overactive bladder symptom. For the risk of falls, a multimodal and personalized management has already shown a benefit in aged patients[31] and is emerging in PwMS[32]. The identification of difficulties for continence with TRV may allow for proposing a personalized and multifactorial intervention. Thus, management may aim to improve the time needed to be ready to void, by treating harmful spasticity or suggesting a walking aid, a grab bar in the toilet for stability, or clothing adapted to the disability to facilitate undressing.

Conclusion

The Time to be Ready to Void (TRV) is a new tool, validated in MS, to help the practitioner measure the global time required to reach the toilet for people with overactive bladder. Inter-rater reliability was excellent and test–retest reliability good, so the test can be used in

everyday practice. The TRV test seems to be useful in clinical practice for people with overactive bladder because it takes in account all the time needed to accomplish micturition (time to go to the bathroom, undress, installation on the toilet) and not just the classical warning time that only assesses the importance of urgency. The contribution of TRV to the overall management of patients will be evaluated in future studies.

343 **Legends**

344 Figure 1. Illustration of the Time to be Ready to Void (TRV).

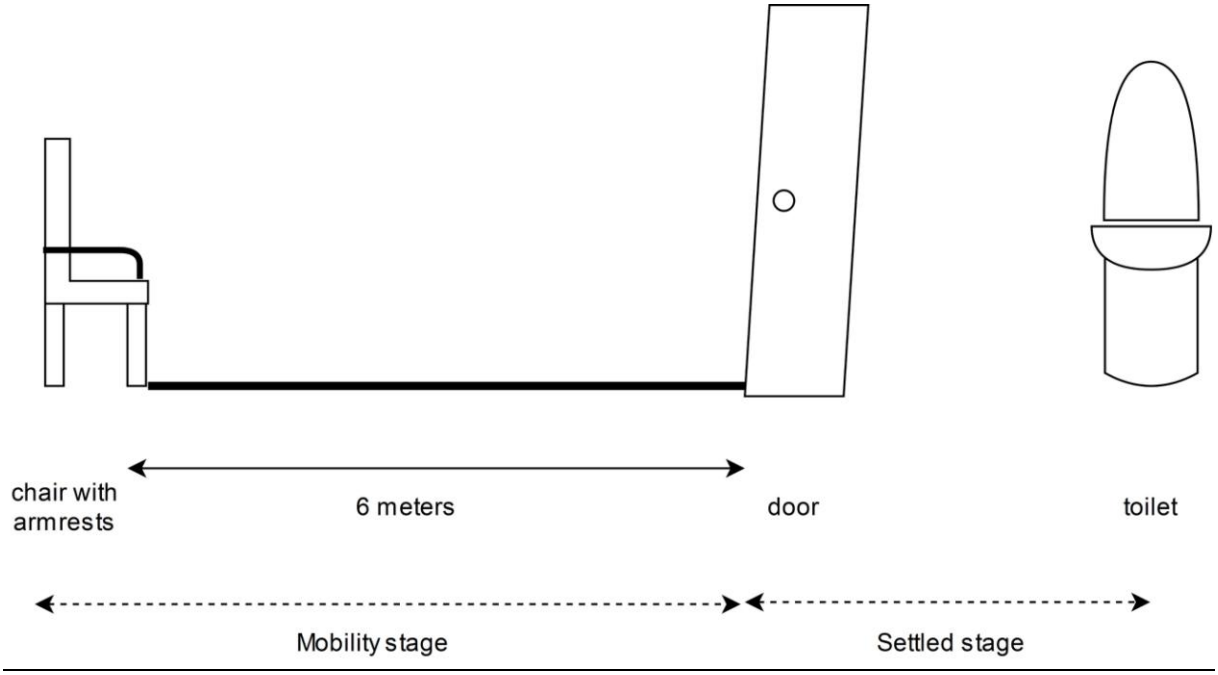

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Figure 2: Bland and Altman plots showing the differences between measures from the 2 test sessions against the mean of the 2 test sessions for each participant for (A) the mobility stage, (B) settled stage, and (C) total TRV test. The line in the center of each graph represents the mean of the differences. The other 2 dashed lines indicate 95% limits of agreement (mean of the difference ± 1.96 SD of the difference between test–retest measurements).

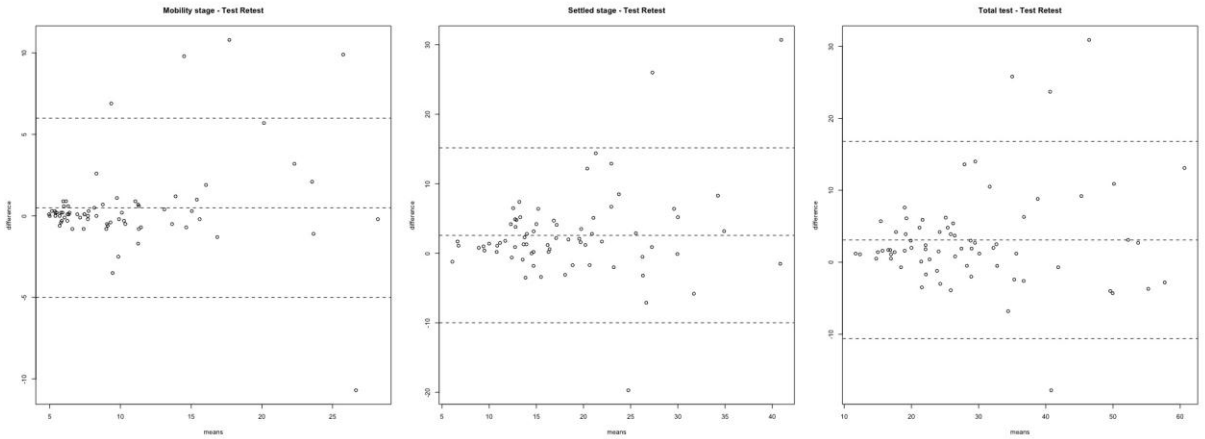

Table 1. Initial characteristics of participants with multiple sclerosis.

Age, years, mean (SD)	54.4 (11.7)
Female	58 (82%)
BMI, mean (SD)	25.5 (5.5)
EDSS, median [Q1-Q3]	6 [5-6]
FIM score, mean (SD)	100.5 (11.5)
TMT, median [Q1-Q3]	20 [15-25]
Detrusor overactivity during the previous urodynamics	21 (30%)
USP score, mean (SD)	
USP stress score (/9)	1.2 (2.4)
USP OAB score (/21)	6.3 (4.7)
USP low stream score (/9)	5.8 (3.5)
Warning time, min	
≤ 5	30 (42%)
6-15	24 (34%)
> 15	17 (24%)
Micturition status	
Spontaneous void	32 (45%)
CISC	15 (21%)
Mixed	24 (34%)
Urinary incontinence	
Indoor	32 (45%)
Outdoor	38 (53%)
Clothes	
Pants/tights	68 (96%)
Skirt	5 (7%)
Belt	30 (42%)
Button	49 (69%)
Zipper	42 (59%)
Diaper	14 (20%)
Walking device during TRV	
Cane	13 (18%)
2 canes or walker	7 (10%)

BMI, body mass index; EDSS, Expanded Disability Status Scale; FIM, Functional Independence Measure; TMT, Tinetti Mobility Test; USP, Urinary Symptom Profile; OAB, overactive bladder; CISC, Clean Intermittent Self Catheterization; TRV, Time to be Ready to Void

Table 2. Variation in TRV test score by EDSS score.

	Mobility stage				Settled stage				Total test	
EDSS score	Mean (SD)	P value	Difficulty	P value*	Mean (SD)	P value	Difficulty	P value*	Mean (SD)	P value
< 4	5.81 (0.67)	< 0.0001	2.75 (0.71)	< 0.0001	17.02 (7.58)	0.22	2.75 (0.71)	0.02	22.84 (7.98)	0.003
4-5.5	7.40 (2.04)		2.35 (0.81)		18.06 (10.12)		2.50 (0.76)		25.46 (10.13)	
≥6	13.87 (6.80)		1.53 (0.74)		21.86 (9.16)		1.94 (0.89)		35.73 (13.95)	

TRV, Time to be ready to Void; EDSS, Expanded Disability Status Scale; Difficulty, difficulty to realize the stage assessed by a 4-point Likert scale: 0, impossible or need human help, and 3, no difficulty

* difference in difficulty

Table 3. Test–retest reliability of the TRV test.

	ICC [95% CI]	SEM (SEM%)	SRD95 (SRD95%)
Mobility stage	0.88 [0.79-0.95]	2.04 (19)	5.65 (54)
Settled stage	0.67 [0.50-0.84]	4.93 (27)	13.66 (74)
Total TRV	0.81 [0.69-0.92]	5.41 (19)	15.0 (52)

ICC, intraclass correlation coefficient; 95% CI, 95% confidence interval; SEM, standard error of measurement; SRD95: 95% certainty representing the smallest change to be detected beyond the measurement error; TRV, Time to be Ready to Void

386 **Table 4.** Internal consistency of the TRV.

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	Mobility stage		Settled stage	
	ρ	P value	ρ	P value
10MWT	0.88	<0.0001	-	-
TUG	0.89	<0.0001	-	-
EDSS	0.68	<0.0001	0.34	0.006
TMT	-0.67	<0.0001	-0.48	<0.0001
FES-I	-	-	0.17	0.14
NHP right	-	-	0.31	0.007
NHP left	-	-	0.32	0.007
NHP (right + left)	-	-	0.35	0.003
FIM score	-	-	-0.36	0.002
Katz-ADL	-	-	0.24	0.044

388 ρ, Spearman's correlation coefficient; 10MWT, 10-meter walk test; TUG, Timed Up and Go test;
389 EDSS, Expanded Disability Status Scale; TMT, Tinetti Mobility Test; FES-I, Fall Efficacy Scale
390 International; NHP, Nine Hold Peg Test; FIM, Functional Independence Measure; Katz-ADL, Katz –
391 activities of daily living index;

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