

The Timed "Up & Go": A Test of Basic Functional Mobility for Frail Elderly Persons

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This study evaluated a modified, timed version of the "Get-Up and Go" Test (Mathias et al, 1986) in 60 patients referred to a Geriatric Day Hospital (mean age 79.5 years). The patient is observed and timed while he rises from an arm chair, walks 3 meters, turns, walks back, and sits down again. The results indicate that the time score is (1) reliable (inter-rater and intra-rater); (2) correlates well with log-transformed scores on the Berg Balance Scale ($r = -0.81$), gait speed ($r = -0.61$) and

Barthel Index of ADL ($r = -0.78$); and (3) appears to predict the patient's ability to go outside alone safely. These data suggest that the timed "Up & Go" test is a reliable and valid test for quantifying functional mobility that may also be useful in following clinical change over time. The test is quick, requires no special equipment or training, and is easily included as part of the routine medical examination. J Am Geriatr Soc 39:142-148, 1991

The assessment of physical mobility is an essential component of the "geriatric assessment" of the frail elderly individual.¹⁻³ For independent mobility, one generally must be able to, at least, perform what Isaacs⁴ has called the "basic mobility skills" of getting in and out of a bed and chair, on and off a toilet, and walking a few feet. It is these basic functional maneuvers, therefore, that are the focus of the assessment of mobility in frail elderly persons.

Physical mobility can be assessed in several ways. The traditional neuromuscular examination, while useful in establishing a diagnosis and determining disease severity, has been shown to be a poor indicator of functional capacity.² Activities of daily living (ADL) questionnaires that assess functional skills through self-report or observer-report are customarily included in a "geriatric assessment."¹⁻⁵ The responses obtained may not always be accurate, however, for reasons of language, culture, hearing, intellectual capacity, or even pride.^{1,3,6} Laboratory testing of specific motor

abilities such as balance or gait speed on sway platforms or treadmills are impractical in most clinical settings.⁷⁻⁹ These constraints have prompted the development of mobility tests that contain the balance and gait maneuvers used in everyday life.^{10,11} In these tests, the separate items such as getting out of a chair, bending, reaching, standing on one leg, etc., are either timed or rated according to the quality of the performance.^{2,12-15} Unfortunately, because of the length and complexity of these tests it is usually not practical to use them in a busy office setting or to include them in the initial "geriatric assessment" when the patient is frail.

A very appealing test has been reported by Mathias et al,¹⁶ "Balance in the Elderly Patient: the 'Get-Up and Go' Test." The subject is observed while he rises from an arm chair, walks 3 meters, and returns to the chair. The test standardizes most of the "basic mobility" maneuvers and yet is quick and practical. Unfortunately, the scoring system is imprecise. The performance is rated on a scale of 1 to 5 according to the observer's perception of the patient's risk of falling. While the extremes of the scale, 1 and 5, are easy to score, the intermediate numbers, 2 to 4, are less clear. This may explain some of the variation in scores obtained by different observers.

We have been using a modified timed version of the test, developed by one of us (D. P.), as a test of basic mobility skills. The patient is asked to perform the same tasks: rise from a standard arm chair, walk to a line on the floor 3 meters away, turn, return, and sit

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down again. The score given is the time taken in seconds to complete the test.

The purpose of this study was to assess the clinical usefulness of the timed "Up & Go" as a short test of basic mobility skills in a population of frail community-dwelling elderly persons. Specifically, the time score was evaluated with respect to its reliability between raters and over time, as well as to its validity as a measure of balance, gait speed, and functional capacity. In addition, preliminary evidence of the responsiveness of the time score to clinical change over time is presented.

METHODS

The timed "Up & Go" measures, in seconds, the time taken by an individual to stand up from a standard arm chair (approximate seat height of 46 cm), walk a distance of 3 meters, turn, walk back to the chair, and sit down again. The subject wears his regular footwear and uses his customary walking aid (none, cane, or walker). No physical assistance is given. He starts with his back against the chair, his arms resting on the chair's arms, and his walking aid at hand. He is instructed that, on the word "go," he is to get up and walk at a comfortable and safe pace to a line on the floor 3 meters away, turn, return to the chair, and sit down again. The subject walks through the test once before being timed in order to become familiar with the test. Either a wrist-watch with a second hand or a stop-watch can be used to time the performance.

The study population consisted of 60 consecutive patients referred from the community to the Geriatric Day Hospital at the Royal Victoria Hospital, Montreal. Ten active, healthy, normal volunteers over the age of seventy were also tested.

Reliability testing was performed on patients attending Day Hospital over a 2-month period. Those with stage IV Parkinson's disease and those who were medically unstable were excluded from the reliability study. Three raters and two locations were used. A physiotherapist tested the patients in the gym using a standard arm chair (seat height 45 cm; arm height 65 cm). A physician and a patient attendant tested the patients in the examining room using a different armchair (seat height 47 cm; arm height 63 cm). Inter-rater reliability was tested on 22 patients as they performed the timed "Up & Go" for the three raters in random order at different times of the same day. Intra-rater reliability was tested on twenty patients as they performed the timed "Up & Go" for the same observer (physiotherapist, $n = 20$; physician, $n = 10$; patient attendant, $n = 10$) on two consecutive visits to Day Hospital.

Testing for validity of the timed "Up & Go" was more difficult as there is no "gold standard" with which to compare this new measure. We therefore hypothesized

that the timed "Up & Go" score would correlate with the patient's balance, gait speed, and functional capacity. The Berg Balance Scale¹⁵ was used in our study since we had knowledge of its measurement properties. The content development, as well as preliminary studies of reliability and criterion validity have been described. (Intraclass correlation coefficient for intra- and inter-rater reliability were 0.98 and 0.99, respectively; internal consistency, alpha 0.96). The scale contains 14 items which are each scored out of 4 for a total of 56 points. The mobility maneuvers assessed include (a) getting in and out of a chair, sitting unsupported, and transferring from bed to chair, (b) maintained standing with feet together, feet apart, and with eyes closed, (c) turning to each side and turning 360 degrees, (d) reaching forward, (e) picking an object up from the floor, (f) tandem and unilateral stance, and (g) dynamic weight shifting.

Gait Speed was measured as the time taken to walk the middle 15 meters of a 20-meter walk, in meters per seconds. (The first 3 meters and the last 2 meters were considered to be the warm-up and the deceleration phases and were not included in the calculation). The patient walked with their customary walking aid at a freely chosen speed.

Functional capacity was estimated using the Barthel Index of ADL and a clinical estimation of the patient's ability to go outside alone. The Barthel Index of ADL^{18,19} is a self or proxy questionnaire which measures three categories of function: (1) self-care (drinking from a cup, eating, dressing the upper and lower body, grooming, and washing), (2) continence of bowel and bladder, and (3) mobility (transfers in and out of a chair, toilet, and a tub or shower, walking 50 yards and climbing stairs). It is scored on a continuum from 0 (totally dependent on another's help) to 100 (totally independent). It has been shown to be a reliable and valid measure.

The patient's ability to go outside alone was also estimated clinically at the initial assessment. If the patient stated that he or she did in fact go out alone, the physiotherapist judged whether or not she thought that the patient's balance, gait speed, and general mobility skills were adequate to ambulate outside safely. The patients were then placed into 1 of 3 categories: (1) could walk outside independently and safely; (2) walked outside independently but was judged to be unsafe; and (3) was dependent on the assistance or supervision of others to go outside.

The intraclass correlation coefficient (ICC) was used to estimate the test's reliability.²⁰ It provides an estimate of the average correlation between all possible pairs of ratings. The calculation is based on an analysis of variance which estimates the amount of variance attributable to subjects, raters, and unexplained error.

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sess the approximate relationship of the timed "Up & Go" with balance, gait speed, and the Barthel Index of ADL.

RESULTS

Ten normal elderly volunteer control subjects (6 men, 4 women; mean age 75.0; range 70-84 years) all performed the timed "Up & Go" in 10 seconds or less (mean 8.5 seconds; range 7 to 10 seconds).

The study population included 23 men and 37 women with a mean age of 79.5 years (range 60-90 years). All lived in the community. None was more than mildly demented as measured by the Folstein mini-mental status test^{17, 18} (mean score 28.0). The major medical diagnoses were cerebral vascular accident (CVA) (*n* = 23), Parkinson's disease or syndrome (*n* = 10), rheumatoid or osteoarthritis (*n* = 9), and miscellaneous conditions such as post-surgical hip fractures, cerebellar degeneration, and general deconditioning (*n* = 18).

The 60 subjects varied widely in their ability to perform all of the mobility tasks. Time scores on the "Up & Go" ranged from 10 to 240 seconds in 57 patients (Figure 1). Three patients were unable to perform the test. One couldn't get out of the chair and two couldn't walk without assistance. Scores on the balance scale ranged from 6 to 56/56 (Figure 2; data not available in 7 subjects). There was also a wide variation in gait speed (0.1-1.4 M/sec; Figure 3). Seven patients did not have the stamina to complete this test.

Functionally, the group tended to be fairly independent in performing basic activities of daily living. Only six of the sixty subjects scored less than 60 of a possible 100 on the Barthel Index of ADL (Figure 4).

There was no relationship between the score on the timed "Up & Go" and the patient's medical diagnosis (Figure 5).

Twenty-two medically stable patients attending the Day Hospital over a 2-month period participated in the

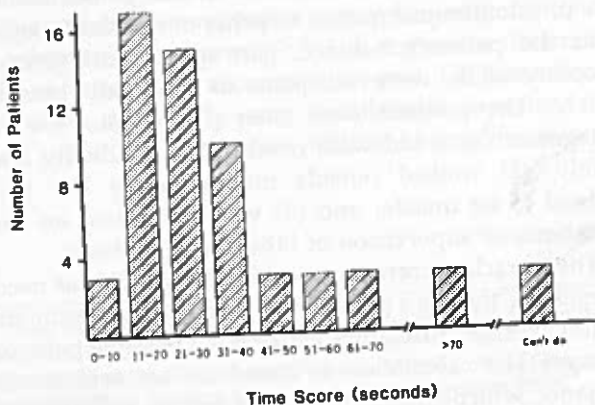


FIGURE 1. Frequency distribution of the time score in seconds; >70, 3 patients scored in this category: 70 sec, 181 sec and 240 sec.

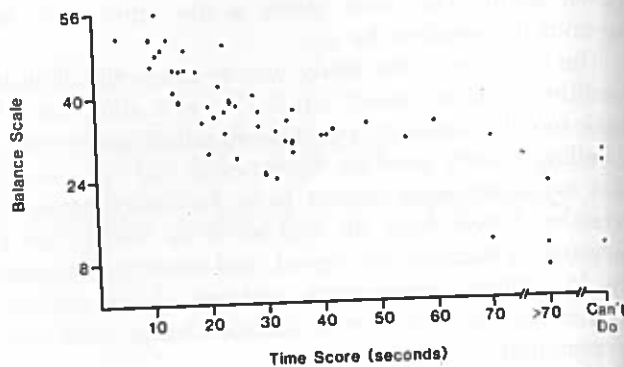


FIGURE 2. Relationship between the timed Up & Go score in seconds and the score on a Balance Scale, $r = -0.72$ (log transformed $r = -0.81$).

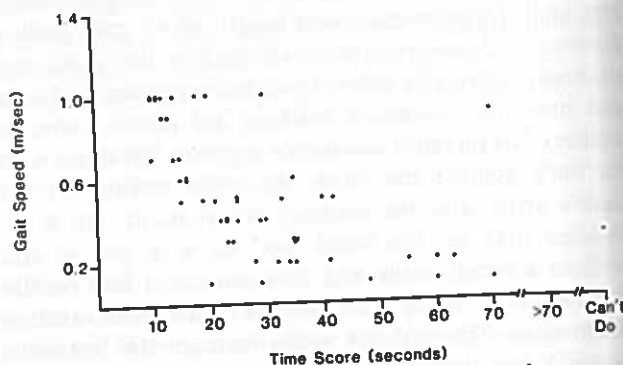


FIGURE 3. Relationship of the timed Up & Go score in seconds and the gait speed in meters per second, $r = -0.55$ (log transformed $r = 0.61$).

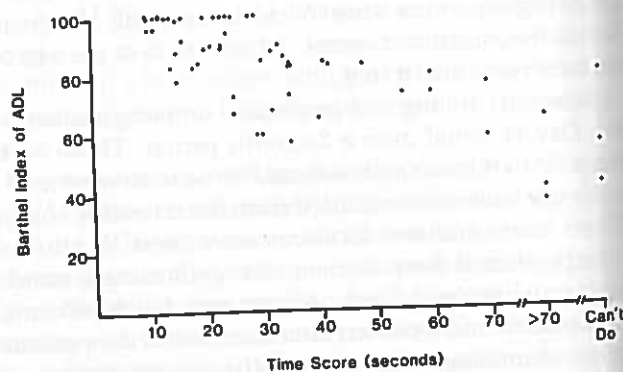


FIGURE 4. Relationship of the timed Up & Go score in seconds and the score on the Barthel Index of ADL, $r = -0.51$ (log transformed $r = -0.78$).

reliability studies. Their medical diagnoses were similar to those in the original study. Their scores on the timed "Up & Go" ranged from 11 to 128 seconds. There was good agreement in the time scores obtained both between raters (ICC 0.99) and within the same raters on two consecutive visits (ICC 0.99). All but two of the patients varied in their time scores by 5 seconds or less

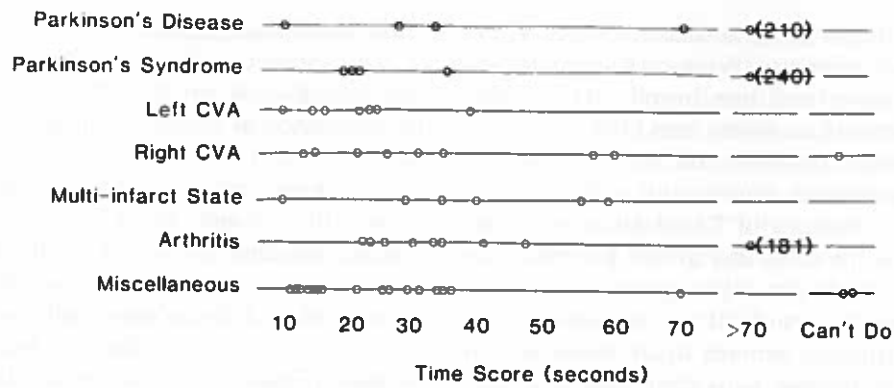


FIGURE 5. Relationship of the timed Up & Go score in seconds and the medical diagnosis.

both between observers on the same day and for the same observer on consecutive visits from 3 days to 5 weeks apart. Two patients varied by 7 and 10 seconds between observers.

The results of this study support our hypothesis that the timed "Up & Go" score would correlate with the patient's balance, gait speed, and functional capacity. The patients' time score on the "Up & Go" related well to their scores on the Berg Balance Scale ($r = -0.72$; Figure 2), their gait speed ($r = -0.55$; Figure 3), and their scores on the Barthel Index of ADL ($r = -0.51$; Figure 4). These correlations become even stronger when the Balance, Gait Speed, and Barthel Index Scores are log-transformed ($r = -0.81, -0.61, \text{ and } -0.78$, respectively), a fact that suggests a curvilinear relationship (Figures 2, 3, and 4).

The ability of the "Up & Go" time score to reflect functional mobility skills can be seen in Tables 1 and 2 where the patients have been arbitrarily divided into three groups according to their "Up & Go" time scores; <20 seconds, 20-29 seconds, and 30 seconds or more. All of those who completed the "Up & Go" in less than 20 seconds were independent for basic transfers. Many were independent for tub or shower transfers. Most could climb stairs or go outside alone. Those who took more than 30 seconds to complete the test, on the other hand, tended to be much more dependent. Many needed help with chair and toilet transfers. Most needed help to get in and out of the tub or shower. Only one of the patients in this group could climb stairs without assistance. None could go out alone.

DISCUSSION

In our population of frail, community-dwelling, elderly persons, the timed "Up & Go" appears to be a practical, reliable performance test of physical mobility. Preliminary evidence suggests that it is also an objective means of following functional change over time.

The test is practical because of its simplicity. It is quick and easy to administer and requires no special equipment. We used a wrist-watch with a second hand

TABLE 1. THE ABILITY OF "UP & GO" TIME SCORES TO REFLECT BASIC MOBILITY SKILLS

		Timed "Up & Go" (Sec)		
		10-19 n = 17	20-29 n = 15	30+ n = 26
		%	%	%
* Chair transfers	Self	100	93	62
	Needs help	0	7	35
	Can't do	0	0	3
* Toilet transfers	Self	100	87	73
	Needs help	0	13	27
	Can't do	0	0	0
Walking aid	None	41	6	0
	Cane	47	75	48
	Walker	6	0	41
	Supervision	6	19	11

* As described in Barthel Index, Mahoney 1964.

TABLE 2. THE ABILITY OF "UP & GO" TIME SCORES TO REFLECT EXTENDED MOBILITY SKILLS

		Timed "Up & Go" (Sec)		
		10-19 n = 17	20-29 n = 15	30+ n = 26
		%	%	%
* Tub or shower transfers	Self	59	60	23
	Needs help	41	40	77
	Can't do	0	0	0
* Walk 50 yards	Self	82	67	15
	Needs help	18	33	50
	Can't do	0	0	35
* Climbs stairs	Self	77	60	4
	Needs help	23	40	81
	Can't do	0	0	15
Goes outside alone	Yes	76	25	0
	Yes, not safe	6	25	15
	Needs help	18	50	85

* As described in Barthel Index, Mahoney 1964.

and standard arm chairs. Professional expertise or training are not required as the instructions are straightforward and the time score is objective and easy to record.

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The reliability studies indicate that medically stable patients vary little in their time score on the "Up & Go" either between raters or over time. In spite of the frailty of many of the patients, variation was only 5 seconds or less either between observers on the same day or for the same observer on consecutive visits up to 5 weeks apart. The variations of 7 and 10 seconds between observers on the same day in two patients with time scores in the 40–50 second range appeared to be related, in the first case, to difficulty in maneuvering the walker when turning around to sit down and in the second case to trouble with chair mobility. The inconsistent performance in these patients in the slowest time group may reflect the reality of true variation. This aspect of the test warrants further study.

As a test of physical mobility, the time score on the "Up & Go" correlates well with performance on more formal balance testing as well as gait speed (Figures 2 and 3). It also gives a rough indication of functional capacity as indicated by the good correlation between "Up & Go" times and scores on the Barthel Index of ADL (Figure 4).

For the clinician, the practicality of using the "Up & Go" time score to suggest functional skills can be seen in Tables 1 and 2 where the patients are arbitrarily divided into three groups according to their "Up & Go" time score. The patients who performed the test in less than 20 seconds tended to be independently mobile. All of them were able to get in and out of a chair and on and off a toilet without assistance. Almost all walked independently or with a cane (Table 1). This group also had reasonable balance and a functional gait speed. They performed in the upper third of the Berg Balance Scale (Figure 2) and had a gait speed of at least 0.5 meters per second (Figure 3) which has been suggested as the minimal gait velocity required to cross a street.²¹ The majority were able to walk 50

yards, climb stairs, and go out on the street alone (Table 2). The patients who took 30 seconds or more to complete the test, on the other hand, tended to need the assistance of others for many mobility tasks. As can be seen in Table 1, many in this group needed help with the basic tasks of getting in and out of a chair or on and off a toilet. None were able to climb stairs without assistance or go out on the street alone (Table 2). The patients in this group scored in the middle or lower portion of the balance scale. None scored as high as those who completed the "Up & Go" in less than 20 seconds (Figure 2). This group also walked more slowly. With one exception, all had a gait speed of 0.5 meters per second or less (Figure 3). The exception was a woman with Parkinson's disease who had great difficulty with chair mobility.

The 25% of our population who took between 20 and 29 seconds to complete the "Up & Go" fell into an intermediate "grey zone." As a group, they varied widely with respect to balance (Figure 2), gait speed (Figure 3), and functional capacity (Figure 4, Tables 1 and 2). Further assessment was needed in order to clarify their functional level.

The time score on the "Up & Go" is a simple measure of physical mobility which can be used either as a screening test or as a descriptive tool. It may also prove to be a useful measure to monitor change over time.^{5, 18, 22, 23} As a screening test, the time score quickly indicates the patient's level of physical mobility. It identifies the freely independent individual who performs the test in <10 seconds as well as the very dependent person who cannot transfer out of a chair or walk without assistance. For the patient who falls between these two extremes, the time score also indicates balance, gait speed, and functional capacity. When performed early in the examination, it saves professional time and patient energy. The professional can focus immediately

TABLE 3. FUNCTIONAL CHANGE OVER TIME AS MEASURED BY THE TIME SCORE

Case	Age/Sex	Diagnosis	Walking Aid	Weeks in Program	Up & Go (sec)	Qualifier
A	85/F	Parkinson's disease	None	0	0	Chairbound
			Walker	2	210	Unsteady
			Walker	4	120	Deliberate
			Walker	7	72	
			Walker	13	54	Steady
			Walker	21	44	
B	84/F	Peripheral neuropathy	Walker	0	70	Unsteady
			Walker	46	46	Stable
C	75/F	Right CVA	Cane	0	34	Unsteady
			Cane	15	18	Stable
D	74/M	Right total hip replacement	2 Canes	0	29	Unsteady
			1 Cane	21	14	Stable
E	80/M	Alcohol abuse, mild dementia	Walker	0	35	Unsteady
			Walker	8	38	Steadier
			Walker	15	37	No change
F	87/M	Multi-infarct state	Walker	0	33	Stable
			Walker	5	55	Unsteady

on areas requiring further assessment, bypassing irrelevant questions and tests.

As a descriptive tool, the time score describes the patient's level of functional capacity. One can take as an example a telephone description of a 66 year old woman with severe osteoarthritis and a timed "Up & Go" score of 41 seconds with a walker. From the time score alone, one expects that she has impaired balance and a slow gait. She may have difficulty with chair or toilet transfers. It is unlikely that she can bathe herself, climb stairs, or go outside alone.

As the reliability studies indicate, medically stable patients vary little in their time score on the "Up & Go" either between raters or over time. This suggests that the time score could be a useful, objective measure of clinical change. Six examples from our clinical practice, given in Table 3, illustrate how the test can be used to document change over time. Mrs. A was started on Sinemet for untreated Parkinson's disease. After the seventh week, in spite of the fact that she remained in the "functionally dependent" category, her mobility continued to improve. Mrs. B's mobility also improved within the functionally dependent category. Mrs. C and Mr. D both improved in their functional categories as a result of their therapy, yet findings on neuromuscular examination did not change measurably. Without the time score, the improvements made might not have been apparent to the family physician in his office. The "Up & Go" time score can also document a lack of improvement or even a deterioration of which the patient or his health care provider may be unaware. Mr. E appeared to the staff of the Day Hospital and his community workers to be benefiting from the program. The lack of change in his "Up & Go" score helped us all to realize that his mobility had not improved in spite of intensive therapy. Mr. F, during the 5 weeks reported here, was functionally doing more because his wife had been hospitalized. He was, however, less clean and was beginning to fall at home. The deterioration in his "Up & Go" time score was objective evidence of his deterioration. The ability of the "Up & Go" time score to measure small yet clinically significant changes in mobility may prove to be useful in following the very frail patient where a change in functional capacity is often difficult to document objectively.²² This aspect of the test warrants further study in a larger population.

Our patient population represents the middle portion of the spectrum of functional abilities in elderly persons. None was completely independently mobile and enjoying such activities as riding a bicycle or climbing a ladder. Neither were any completely dependent on others. Most required some help with activities involving more complex mobility skills such as shopping (93%), housework (93%), laundry (78%), and meal preparation (69%). On the other hand, most were

independent in the basic motor skills. Ninety-six percent could get out of a chair and walk at least 6 meters without help, ie perform the timed "Up & Go" test; 70%–80% could feed, dress, and wash themselves, and 50% could take a bath or shower alone.

It is within this middle functional subset of the elderly population that the timed "Up & Go" test is most useful. Although, as a screening tool, it can identify both the freely mobile who perform the test in less than 10 seconds and the very dependent who require help to get out of a chair or walk, it cannot measure gradations of functional mobility or change in either of these groups. Further study of the test is needed, therefore, in populations where the prevalence of disability differs from that of the present study.

In summary, the timed "Up & go" is a useful and practical measure of physical mobility for assessing frail elderly persons. It is quick and easy to perform without special equipment or training. It fulfills most of the criteria required of a functional measurement as suggested by Kane,^{22,23} Granger,¹⁸ and Solomon.⁵ It is reliable both between raters and over time. It has content validity, in that it evaluates a well recognized series of maneuvers used in daily life, and concurrent validity, in that it correlates well with more extensive measures of balance, gait speed, and functional abilities. As a screening tool, it places the patient into a functional category and indicates those requiring further assessment. As a descriptive tool, it gives information about the patient's balance, gait speed, and functional ability. It may be sensitive to increments of change that have clinical significance yet might otherwise escape notice. This and its predictive capacity warrant further study.

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