Timed Up and Go (TUG): Reference Guide

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Introduction

The Timed Up and Go (TUG) is a performance-based outcome measure designed to assess basic functional mobility in elderly and for identifying individuals who are at risk for falls [1]

Establishing Author: Podsiadlo 1991 [1]   **Data Type:** Ratio

Measurement Type: Performance-Based Outcome Measure   **Assessment Type:** Observer

Psychometric Properties

The TUG has been shown to have a high level of psychometric properties in a variety of populations including lower limb amputees [2], spinal cord injury [3], community dwelling elderly [1], the Parkinson's Disease [4], and chronic stroke [5].

Table 1. A comparison of psychometric properties tested in common outcome measures

Outcome measure	Reliability			Validity	Responsiveness		Normative Data
	Test-Retest	**Inter-rater**	**Intra-rater**		**MDC**	**Floor/Ceiling Effect**	
FSST	yes	no	yes	yes	no	floor	yes
Single Limb Stance	yes	no	no	yes	no	ceiling	yes
Timed Up & Go	yes	Yes	yes	yes	yes	ceiling	yes
L-Test	no	yes	yes	yes	yes	none	yes

Reliability. Excellent inter-rater and intra-rater reliability has been established for use of the TUG in populations of lower limb amputees [2], spinal cord injury [3], community dwelling elderly [1,6], Parkinson's Disease [7] and chronic stroke [5]. Test-retest reliability was found to be excellent in populations of lower limb amputees [8], community dwelling elderly [1,9,10], Parkinson's Disease [7], and chronic stroke [11,12]. The TUG has also shown excellent test-retest reliability in children with physical disability [13], Parkinson's disease [7].

Validity. A low but significant correlation established convergent validity between the TUG and the Groningen Activity Restriction Scale (GARS), Sickness Impact Profile (SIP) Mobility Control and SIP Mobility Range in lower limb amputee populations [2]. Convergent validity has also been established for the TUG in the community dwelling elderly when correlated with the Daily Living Scale (OARS IADL) and OARS Activities of Daily Living (OARS ADL) [14], Cumulative Illness Rating Scale (CIRS) [15], Barthel Index (r = -0.48) [16], Berg Balance Scale (r = -0.76) [17], Tinetti (r = 0.74) [17], FIM [18]. Construct validity of the TUG in the community dwelling elderly community was established by distinguishing known groups separated by use of ambulatory aids [18]. Convergent validity was established between the TUG and The strength of the affected ankle plantarflexors, gait parameters measured with GAITRite II (Sparta, NJ), and walking endurance [5](Ng 2005). Excellent convergent validity has been established in stroke populations with the Gait velocity (r = 0.99) [5]and the 6 min TWT (r = -0.96) [19]Criterion validity was established between the TUG and the Gross Motor Function Measure in children with physical disability [13].Excellent convergent validity was found in spinal cord injury populations between the TUG and

10 meter Timed Walk Test (10 m TWT) [3][20] and 6 minute Timed Walk Test (6 min TWT). Convergent validity was established between the TUG and Modified Webster Scale in patients with Parkinson's disease [7].

Responsiveness. The TUG was found to be responsive to changes in medication cycle in persons with Parkinson's Disease [7], change after a five month follow up period in children with physical disability [13], change from admission to discharge in community dwelling elderly [18] and recovery during the first three months following a stroke [21]. It also was sensitive and specific in identifying fall risk in elderly [6]. When assessed for floor and ceiling effects, some authors found no effects in the healthy elderly population [22] or spinal cord injury population [23].

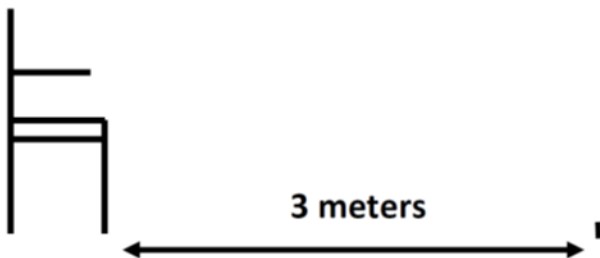## Required Resources

Time: < 5 minutes

Personnel: 1 person

Equipment: a stopwatch and chair of standard height (seat height 46cm, arm height 67cm)

Space: about 18 square meters: 7m walkway, space for chair and turnaround area

Cost: free

Test Administration

3 meters

1. Set up the a chair (seat height 46cm, arm height 67cm)
2. Place a piece of tape on the floor 3 m away from chair
3. Instruct the subject to stand up and walk to the line on the floor and back when you say "Go" as quickly and safely as possible.
4. Start the stopwatch when you say "Go" and stop it when the subject sits again

The subject receives one demonstration and one practice trial. The subject then completes two trials with the better time being recorded.

Interpretation

Shorter time to finish the test represents better functional mobility. Several threshold values of increased fall risk have been established in various populations using the Timed Up and Go. The cut-off score for fall risk in healthy community dwelling elderly was found to be 13.5s [6]. The cut-off score that differentiated non-fallers from

Figure 1. Testing configuration. The subject begins seated in a standard chair, walks to a line 3m away, and returns to sit in the chair.

multiple fallers in transtibial amputees was 19s [24].

Normative data for various patient populations as well as Minimal Detectable Change (MDC) values are summarized in the tables below. Clinicians can compare results from testing patients against these times and use to that to justify the prescription of an orthotic or prosthetic intervention. Medical necessity can be shown by:

- Surpassing a threshold of reduced fall risk.
- Returning a patient to a score that is average among a patient's normal peers.
- Reduction in time that exceeds the Minimal Detectable Change (MDC).

Table 2. Normative data for the TUG

TUG Normative Data				
Population	Time (sec)	SD	Number	Age Mean (range)
Community Dwelling Elderly				
60-69 [25]	8.1	-	176	(60-69)
70-79 [25]	932	-	798	(70-79)
80-99 [25]	11.3	-	1102	(80-99)
60-99 [25]	9.4	-	4395	(60-99)
Admission [18]	31.9	20.9	46	79.9 (62-94)
Discharge [18]	21.2	10.3	36	79.9 (62-94)
Pediatrics with Physical Disabilities				
Pediatric hemiplegia [13]	8.4	1.3	4	8 (3-19)
Pediatric spastic diplegia [13]	10.1	2.4	22	8 (3-19)
Pediatric Spastic quadriplegia [13]	28	26	6	8 (3-19)
Pediatric Spina Bifida [13]	8	1.5	7	8 (3-19)
Parkinson's Disease				
Parkinsons's Disease [26]	20.91	10.38	30	77 (64-87)
Parkinson's Disease Healthy Control [26]	12.91	3.75	30	77 (64-87)
Parkinson's Disease [27]	16.4	3.8	19	74.3 (61-84)
Healthy Older Adults [27]	9.85	1.44	10	76.4 (68-86)
Stroke				
Stroke [5]	22.6	8.6	11	61.1
Non-stroke Healthy Controls [5]	9.1	1.6	10	63.5
Stroke with AFO [28]	27.5	19.87	25	60
Stroke without AFO [28]	30.92	17.99	25	60
First week [21]	17	11	68	72.6 (47-94)
3 months [21]	14.5	10	77	72.6 (47-94)
6 months [21]	14.2	9.4	71	72.6 (47-94)
12 months [21]	14.7	9.8	70	72.6 (47-94)
LE Amputation				
Transtibial [2]	23.8	23	27	73.5 (61-86)
Transfemoral [2]	28.3	12.2	5	72.4 (68-81)
Non-fallers [24]	16.2	5.3	27	59.93
Multiple-fallers [24]	25	6.9	13	65.23
1-Leg Balance: not possible [29]	34.6	17.2	17	73.9
1-Leg Balance: with support [29]	27.3	20.1	37	73.9
1-Leg Balance: Without support <= 10s [29]	24.7	8.7	17	73.9
1-Leg Balance: Without support > 10s [29]	12.7	5.1	28	73.9

Table 3. Timed up and Go MDC

Minimal Detectable Change (MDC)	
Population	MDC
Stroke [30]	2
Stroke [11]	3
Stroke (all MAS) [12]	7.84
Stroke (MAS=0) [12]	3.48
Stroke (MAS=1-1+) [12]	8.24
Stroke (MAS>=2) [12]	8.82
Amputee [8]	3.6

Limitations

The TUG has shown ceiling effects in elderly people who are fit and younger amputees [31] and not able to discriminate fallers from non-fallers in high-functioning elderly [32]. The cut-off score of 13.5s for predicting falls in community dwelling elderly may not be ideal for use in healthy more active subjects [22]. Any subject that cannot perform the tasks in the TUG will encounter a floor effect [33]. To address some of the ceiling effects, additional tasks were added to establish TUG manual (walking while carrying a cup of water) and TUG cognitive (walking while counting backward from 100), as well as adding a 90 degree turn and 7m walkway to establish the L Test [31] [30].

Documentation in Clinical Notes

Example: When assessed with the Timed Up and Go (TUG) patient scored 16 s today. This shows an decrease/increase in time since last assessed on 99/99/9999 and represents and improvement/regression in the functional ambulation. This improvement was greater/less than the Minimal Detectable Change (MDC) established for this population, and the patient also improved/did not improve past the fall risk cut-off score. In comparison to normative data for this population, the patient's current score is higher/lower/similar.

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Disclaimer: The Authors, the Outcomes Research Committee, and the American Academy of Orthotists and Prosthetists does not endorse the use of any single outcome measure over any other single outcome measure and declares no conflict of interest in the presentation of this measure. There may be multiple versions of the instructions published in research literature. This reference guide has attempted to remain consistent with the instructions from the original developers of the outcome measure wherever possible, however in some instances one version of the instructions was chosen for ease of use in the clinic.

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