

Dynamic Gait Index

Introduction

The Dynamic Gait Index is a reliable clinical tool that was developed to assess an individual's balance and fall risk.^{2,4} The results are based on the individual's ability to modify their balance while walking a 20' distance with the presence of external challenges.¹ A total of eight tasks are performed, each representing a single construct.^{1,2} "Scoring focuses on changes in balance or changes in gait patterns during the various walking tasks."⁵ Scores are based on a 4-point scale (0-3), with a best possible score of 24, based on dysfunction during performance.^{1,2} A score of 19/24 or below is indicative of an increased risk of falls.^{2,5} Any score above 21/24 indicates minimal to no risk for falls.³ If an assistive device is used while performing the DGI, max score is considered a 16/24, since a score of "3" cannot be recorded in this case.⁴

Establishing Author: M.E. Tenetti (earliest citation)

Data Type: Task Completion

Measurement Type: Performance- Based Outcome Measure

Assessment Type: Observer

Appropriate Patient Populations

Brain Injury ^{1, 4}	Stroke ^{1, 2, 4, 5}
Geriatric ^{1, 2, 4}	Vestibular Disorders ^{1, 2, 4, 5}
Multiple Sclerosis ^{1, 4, 5}	Bilateral Vestibular Loss ⁵
Parkinson's Disease ^{1, 4, 5}	

Required Resources

Time: <10 min (may vary with patient's ability) ¹

Personnel: Two (Patient and Administrator)

Equipment: Shoe box^{1,2,4,5}, Two (2) obstacles the same size^{1,2,4,5} (i.e. cones), stairs^{1,2} with a handrail^{4,5} and at least 4 steps⁴, 15" wide⁴, 20' pathway ^{1, 2, 5} with indicators at the 0', 5', 10', 15', and 20' points⁴

Cost: Free ¹

Test Administration

The Dynamic Gait Index (DGI) is "a measurement tool that can be used to assess dynamic balance, gait, and risk for falls."⁴ In addition, "evaluating a person's performance on items of the DGI may be useful in identifying gait deviations and in evaluating gait improvements as a result of interventions."² Assistive devices may be used during each test if the patient uses them in their home, but they will not be able to receive a max score of "3" per task with a new maximum score of 16/24.⁴ Any bracing may be worn and does not count against the patient.⁴ Appendix A contains a DGI scoring form as provided by PhysicalTherapyToolBox.com. Also included in Appendix A is a more detailed set-up for the DGI as created by the University of Delaware (pages 4-12).

Psychometric Properties

It is important to know the reliability and validity of a Functional Outcome Measure in order to feel confident in the usefulness and effectiveness of the FOM. Studies have been performed comparing the psychometric properties tested with common outcome measure tests.

Table 1.

Convergent Validity (ρ^*) of the DGI, DGI-4, and FGA⁶

Time Point of Assessment	No.	Versus 10 MWT			Versus PASS		
		DGI	DGI-4	FGA	DGI	DGI-4	FGA
*All <i>P</i> values <0.001.							
First week of therapy	45	-0.68	-0.61	-0.66	0.85	0.75	0.83
2 months after therapy	39	-0.87	-0.77	-0.85	0.76	0.74	0.75
5 months after therapy	35	-0.83	-0.74	-0.81	0.83	0.78	0.83

- Validity

- According to Jau-Hong, et al., compared to the 10 Meter Walk Test, and the Postural Assessment Scale for Stroke Patients, the Dynamic Gait Index had a Validity of moderate to high (on a 0 – 1 scale), increasing from - 0.68, -0.87, and 0.83 with respect to each of the three checkpoints (first week of therapy, two months after therapy, and 5 months after therapy)⁶.

Table 2.

Responsiveness of the DGI, DGI-4, and FGA⁶

Periods of Follow-Up	No.	Effect Size <i>d</i>			Wilcoxon <i>Z</i>		
		DGI	DGI-4	FGA	DGI	DGI-4	FGA
* <i>P</i> <0.01.							
2 months: from first week to 2 months after therapy	39	0.56	0.47	0.50	3.3*	3.0*	3.0*
5 months: first week to 5 months after therapy	35	0.62	0.68	0.54	3.0*	3.4*	2.8*

- Responsiveness
 - o According to Jau-Hong, et al., the effect size *d* for the DGI was moderate and similar in the other outcome measures⁶.

Table 3.
Test–Retest Reliability of the DGI, DGI-4, and FGA⁶

Measure	Test–Retest Reliability		
	ICC (95% CI)	MDC	MDC%
DGI	0.94 (0.90–0.97)	4.0	16.6%
DGI-4	0.92 (0.87–0.96)	2.3	18.8%
FGA	0.95 (0.91–0.97)	4.2	14.1%

- Reliability
 - o According to Jau-Hong et, al., the DGI had an average ICC of 0.94 for the three checkpoints which is a high correlation indicating very high test-retest reliability⁶.

Interpretation⁽¹⁾

As stated earlier, the DGI has a maximum score of 24. Each task is graded as follows¹:

Numeric Value	Interpretation
3	No gait dysfunction
2	Minimal impairment
1	Moderate impairment
0	Severe impairment

Minimal Detectable Change (MDC) varies from population. MDC has been determined as follows:

Patient Condition	MDC
Geriatric	2.9 points ¹
Multiple Sclerosis	4.19-5.54 points ¹
Parkinson’s Disease	2.9 points ¹

Stroke	4 points ¹
Vestibular Disorders	3.2 points ¹

Limitations

An important criteria for this test is that the person must be able to ambulate a minimum of 20' as well as ascend and descend stairs without the assistance of another individual. As a result, the Dynamic Gait Index is not appropriate for low functioning patients.⁵ Another limitation to the DGI is the possibility of a ceiling effect with combined tests and in control subjects.^{1, 2, 5} Ceiling effect is when the test is no longer challenging the patient resulting in an increase in score regardless of the increase in difficulty of the task.

Documentation in Clinical Notes

The score to be recorded in a patients clinical note is indicative of the measure of functional balance they have during walking. Scores that are equal to or less than 19/24 are considered to be associated with an increased risk of falling.⁸ The results of this test are important to document because it can be “useful in identifying gait deviations and in evaluating gait improvements as a result of intervention.”⁷ By documenting the results of this test a clinician is able to track a patients level of improvement over the span of time that they are being treated. This is also helpful in cases where an insurance company is looking for justification as to why a certain service is being provided.⁸

Disclaimer: The Authors, the Outcomes Research Committee, and the American Academy of Orthotitsts 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 the measure. There may be multiple versions of the instructions published in the research literature. This reference guide has attempted to remain consistent with the instructions form the original developers of the outcome measure whenever possible, however in some instances specific versions of the instructions are chosen for ease of use in the clinic.

Resources

¹<http://www.rehabmeasures.org/Lists/RehabMeasures/PrintView.aspx?ID=898>

²http://www.physio-pedia.com/Dynamic_Gait_Index_-_Outcome_Measure

³<http://physicaltherapytoolbox.com/tag/dynamic-gait-index/>

⁴<https://sites.udel.edu/ptclinic/files/2016/01/DGI-Instruction-Manual-1wspb1y.pdf>

⁵<http://www.exercisepd.com/uploads/3/5/3/1/3531021/dgi.functionalgaitassessment.pdf>

⁶<http://stroke.ahajournals.org/content/41/9/2021>

⁷http://www.physio-pedia.com/Dynamic_Gait_Index#Responsiveness

⁸<http://www.exercisepd.com/uploads/3/5/3/1/3531021/dgi.functionalgaitassessment.pdf>

Additional Resources

[http://www.archives-pmr.org/article/S0003-9993\(07\)01447-5/pdf](http://www.archives-pmr.org/article/S0003-9993(07)01447-5/pdf)

<http://geriatrictoolkit.missouri.edu/dgi/>

<https://academic.oup.com/ptj/article-lookup/doi/10.2522/ptj.20050402>

<http://libill.hartford.edu:2105/nahs/docview/894513667/fulltext/1F6E2403D8764E11PQ/1?accountid=11308>

Appendix A

<http://physicaltherapytoolbox.com/tag/dynamic-gait-index/>

<https://sites.udel.edu/ptclinic/files/2016/01/DGI-Instruction-Manual-1wspb1y.pdf>

Appendix A

DGI Task Breakdown:

1. Gait on a Level Surface
 - a. Setup
 - i. Tape Mark at 0 and 20”
 - b. Instruction
 - i. Walk at your normal speed from here to the next mark (20’)
 - c. Grading
 - i. (3) Completes task with no assistive devices, no imbalance, normal speed, normal gait pattern.
 - ii. (2) Walks 20’, uses assistive devices, slower speed, mild deviations.
 - iii. (1) Walks 20’, slow speed, abnormal gait, evidence for imbalance.
 - iv. (0) Cannot walk 20’ without assistance, severe gait deviations or imbalance.
2. Change in Gait Speed
 - a. Setup
 - i. Tape at 0’, 5’, 10’, 15’, and 20’
 - b. Instruction
 - i. Begin walking at your normal pace (for 5’), when I tell you “go,” walk as fast as you can (for 5’). When I tell you “slow,” walk as slowly as you can (for 5’). For the last 5’, walk at normal gait speed
 - c. Grading
 - i. (3) Significant difference between gait speeds compared to normal walking speed. Any gait deviations present are no worse than seen in Item 1.
 - ii. (2) Gait deviation beyond baseline as determined by Item 1. Patient stays within BOS.
 - iii. (1) Significant gait deviation causing patient to weight shift or have path deviation outside BOS. Patient Requires Supervision.
 - iv. (0) Patient requires contact guard assistance, minimum assistance (or more) to maintain balance.
3. Gait with Horizontal Head Turns

*Before performing this item, screen the patient's cervical range of motion. To assess this item, the patient must rotate the head at least 45 degrees or through their full available range of motion.

- a. Setup
 - i. Tape at 0', 5', 10', 15', 20'
- b. Instruction
 - i. Walk at normal pace for 5' with head straight, at which point administrator says "look right." Patient continues walking straight with head turned to the right for 5'. At the 10' mark, administrator says "look left." Patient continues walking straight with head turned to the left for 5'. At the 15' mark, administrator says "look straight." Patient continues walking straight with head straight until 20' mark is reached.
- c. Grading
 - i. (3) No change in gait beyond baseline deviations as established in Item 1
 - ii. (2) Minor disruption in smooth gait as defined by Item 1. Patient must stay within BOS. Slight change in velocity is defined as a visible change in gait velocity with a head turn to one side.
 - iii. (1) Moderate change in gait velocity with head turned to both sides. Score here if patient weight shifts outside BOS, but maintains within 15" path. Score here if patient requires supervision.
 - iv. (0) Score if patient requires contact guard assistance, minimum assistance (or more) to maintain balance. Score if patient is unable to ambulate with head turned to 45 degrees (or through full cervical ROM) in either direction.

4. Gait with Vertical Head Turns

*Before performing this item, screen the patient's cervical range of motion. To assess this item, the patient must move the head at least 45 degrees up/down or through the full available range of motion.

- a. Setup
 - i. Tape at 0', 5', 10', 15', 20'
- b. Instruction
 - i. Walk at normal pace for 5' with head straight, at which point administrator says "look up." Patient continues walking straight with head turned up for 5'. At the 10' mark, administrator says "look down." Patient continues walking straight with head turned down for 5'. At the 15' mark, administrator says "look straight." Patient continues walking straight with head straight until 20' mark is reached.
- c. Grading

- i. (3) Performs with no change in gait from baseline as observed in Item 1
- ii. (2) Minor disruption to smooth gait as determined by Item 1. Patient remains within BOS. Slight change in velocity is defined as a visible change in gait velocity with a head turn to one side.
- iii. (1) Moderate change in gait velocity with head turned to both sides. Score here if patient weight shifts outside BOS, but maintains within 15" path. Score here if patient requires supervision.
- iv. (0) Score if patient requires contact guard assistance, minimum assistance (or more) to maintain balance. Score if patient is unable to ambulate with head tipped to 45 degrees (or through full cervical ROM) in either direction.

5. Gait and Pivot Turn

- a. Setup
- b. Instruction
 - i. Begin walking at normal pace. When instructor says "turn and stop," turn as quickly as you can to face the opposite direction and stop
- c. Grading
 - i. (3) Performs pivot and turn in < 3 seconds and takes < 3 steps to complete turn. A step is defined as the foot leaving the floor. The patient must stay within the base of support.
 - ii. (2) Performs pivot and turn in < 3 seconds and takes 4 - 5 steps to complete turn. A step is defined as the foot leaving the floor. If an assistive device is used, score this category .
 - iii. (1) Performs pivot and turn in > 5 steps to complete turn. Patient steps outside base of support while turning. If supervision is required, use this category.
 - iv. (0) Patient requires contact guard assistance, or assistance to maintain balance.

6. Step Over Obstacle

- a. Setup
 - i. Place obstacle at 10'
- b. Instruction
 - i. Begin walking at normal speed. When you reach the obstacle, stop over it, not around it, and keep walking.
- c. Grading
 - i. (3) Ability to step over the obstacle while maintaining normal stride while ambulating; not changing gait speeds. Obstacle must be cleared with both lower extremities.

- ii. (2) If the patient changes gait speed to step over the obstacle score this category. If an assistive device is used, score this category.
- iii. (1) Score this category if the patient requires an assistive device to complete task.
- iv. (0) If the patient is unable to clear the obstacle with both lower extremities, score this category. If the patient requires contact guard assistance, or assistance to maintain balance, score this category.

7. Step Around Obstacles

a. Setup

- i. Place cone at 5' and 10'

b. Instruction

- i. Begin walking at normal speed. When you come to the first cone (5' away), walk around to the right side of it. When you come to the second cone (10' from start; 5' from first cone), walk around it to the left side.

c. Grading

- i. (3) Ability to walk around obstacles safely without changing gait speed and no signs of imbalance is shown.
- ii. (2) Patient stays within base of support. If an assistive device is required, score this category.
- iii. (1) Significantly slow speed is defined as the patient stopping during the task. If the weight shift falls outside the base of support, score this category. If supervision is required, score this category.
- iv. (0) If the patient is unable to clear the obstacle with both lower extremities, score this category. If the patient requires contact guard assistance, or assistance to maintain balance, score this category.

8. Steps

a. Setup

- i. Perform task with > 4 steps

b. Instructions

- i. Walk up these stairs as you would at home, i.e., using the railing if necessary. At the top, turn around and walk down.

c. Grading

- i. (3) Step over step gait without use of rail
- ii. (2) If the patient requires and assistive device, score this category.
- iii. (1) If the patient requires supervision, score this category.
- iv. (0) If the patient is unable to clear the obstacle with both lower extremities, score this category. If the patient requires contact guard assistance, or assistance to maintain balance, score this category.

