

Dynamic Gait Index

Introduction:

The Dynamic Gait Index (DGI) is a measurement tool that can be used to assess dynamic balance, gait, and risk for falls. Originally developed to assess older adult's fall risk by having the subject adapt to different tasks while ambulating¹, the DGI has been validated in multiple populations.²⁻⁷ The inter-rater reliability has been reported as moderate to excellent.⁶⁻¹⁰ The purpose of this manual is to provide clinicians with a clear set of guidelines that can be used to score this outcome measure. This will confirm that the test is being administered in a standardized way.

Equipment Needed:

- Shoe box
- Two obstacles (must be same size)
- Stairs (with a handrail)
- 20 foot (6.1 meter) pathway

Completion Time:

- 10 minutes

Scoring Interpretation:

- Stroke
 - Reliability
 - Test-retest ICC = 0.96⁷ and 0.94⁵
 - Inter-rater ICC = 0.96⁷
 - Standard Error of Measurement⁷
 - Inter-rater reliability = 0.97 points
 - Intra-rater reliability = 0.94 points
 - Norms: Median (1st-3rd quartiles)⁵
 - 1 week post stroke: 13 (10-18)
 - 2 months post stroke: 14 (10-20)
 - 5 months post stroke: 14 (11-20)
 - MDC
 - 2.6 points⁷
 - 4 points⁵

- Multiple Sclerosis
 - Reliability
 - Inter-rater ICC = 0.983⁸
 - Intra-rater ICC = 0.76 - 0.986⁸
 - Test-retest ICC = 0.85²
 - Standard Error of Measure²
 - Inter-rater reliability = 1.51 points
 - Intra-rater reliability = 2.00 points
 - MDC²
 - 4.19 - 5.54 points
 - Cut Off Scores for Fall Risk
 - < 12²
 - Sensitivity = 45%, Specificity = 80%
 - ≤ 19⁴
 - Sensitivity = 87%, Specificity = 51%
 - PPV = 50%, NPV = 87%
 - +LR = 1.77, -LR = 0.26

- Community-Dwelling Older Adults
 - Standard Error of Measure = 1.04 points¹²
 - Minimal Detectable Change = 2.9 points¹²
 - Minimal Clinically Important Difference¹³
 - 1.90 points for total sample
 - 1.80 for subjects with DGI scores < 21/24
 - 0.60 for subjects with DGI scores ≥ 21/24
 - Cut Off Scores
 - < 19 indicative of increased fall risks¹⁴
 - Sensitivity = 59%, Specificity = 64%
 - ≤ 19 indicates increased risk of falls¹⁵
 - Sensitivity = 67%, Specificity = 86%
 - ≤ 19 indicated increased risk for falls¹⁶
 - Sensitivity = 91%, Specificity = 3%

- Vestibular Disorders
 - Standard Error of Measure = 2.8 points¹⁷
 - Minimal Detectable Change = 3.2 points¹⁷
 - Reliability
 - Inter-rater $k = .64^9$
 - Inter-rater ICC = $.77^{10}$
 - Test-Retest ICC = 0.85^{17}
 - Cut Off Scores
 - $< 19/24$ are 2.58 times more like to have reported a fall in the previous 6 months than subjects with scores above 19¹⁸
 - Sensitivity = 74%, Specificity = 48%
 - $< 19^{10}$
 - Sensitivity = 71%, Specificity = 53%
 - PPV = 39%, NPV = 81%
 - Odds ratio in favor of falling = 2.66

- Parkinson's Disease
 - Reliability
 - Test-retest ICC = $.84^{19}$
 - Minimal Detectable Change¹⁹
 - MDC = 2.9 points
 - MDC% = 13.3%
 - Cutoff
 - 18.5^{20}
 - Sensitivity = 68%, Specificity = 70.8%
 - +LR = 2.33, -LR = .45
 - $< 19^{21}$
 - Sensitivity = 57%, Specificity = 90%
 - $< 22^{21}$
 - Sensitivity = 89%, Specificity = 48%
 - -LR = .27, +LR = 1.86

- Traumatic Brain Injury
 - Cutoff
 - $< 19^{22}$
 - Sensitivity = 85%, Specificity = 69%

General Instructions:

- Perform on a standardized 20 foot walkway (15 inches wide) with the 5 foot, 10 foot and 15 foot points marked
- If your patient has Parkinson's Disease, perform during his/her medication "on" time^{19,21}
- Your patient may take rest breaks as needed throughout the test^{3,23,24}
- Assistive device may be used if your patient uses one inside the home. However, if they use one, they will be unable to score "(3) Normal" on any item. This will make the maximum score 16/24.⁷
- The patient may wear his/her regular brace (i.e. AFO). This does not count against the patient in any scoring item.
- Please demonstrate each task and give instructions as written. The patient is allowed to ask clarification about test instructions

Definitions:

- Supervision is defined as:
 - Verbal cues as required for balance safety
 - Patient requires the examiner to stand within arms reach to ensure balance safety
 - If the therapist supervises the patient during a task item, but deems the patient safe in the task (the patient is "cleared" for the task), the patient's score should reflect performance, not supervision.
- Contact guard assistance is defined as the examiner physically touching the patient, but not aiding in the patient's balance
- Walking aid is defined as an assistive device, not including bracing.

Examination:

Test Item 1: Gait level surface

Original DGI:

Instructions: Walk at your normal speed from here to the next mark (20')

Grading: Mark the lowest category that applies.

(3) Normal: Walks 20', no assistive devices, good speed, no evidence for imbalance, normal gait pattern

(2) Mild Impairment: Walks 20', uses assistive devices, slower speed, mild gait deviations.

(1) Moderate Impairment: Walks 20', slow speed, abnormal gait pattern, evidence for imbalance.

(0) Severe Impairment: Cannot walk 20' without assistance, severe gait deviations or imbalance.

University of Delaware Operationalized Instructions:

(2) Mild Impairment: Mild gait deviation is any gait deviation present. However, the patient must stay within the base of support.

(1) Moderate impairment: An abnormal gait pattern is defined as "evidence for imbalance." This includes any gait deviation that causes the patient to weight shift or have a path deviation outside the base of support. Score this category if the patient requires supervision.

(0) Severe Impairment: Assistance is defined as contact guard assistance, minimum assistance, or more that the patient requires to maintain balance.

Test Item 2: Change in gait speed

Original DGI:

Instructions: 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').

Grading: Mark the lowest category that applies.

(3) Normal: Able to smoothly change walking speed without loss of balance or gait deviation. Shows a significant difference in walking speeds between normal, fast and slow speeds.

(2) Mild Impairment: Is able to change speed but demonstrates mild gait deviations, or no gait deviations but unable to achieve a significant change in velocity, or uses an assistive device.

(1) Moderate Impairment: Makes only minor adjustments to walking speed, or accomplishes a change in speed with significant gait deviations, or changes speed but has significant gait deviations, or changes speed but loses balance but is able to recover and continue walking.

(0) Severe Impairment: Cannot change speeds, or loses balance and has to reach for wall or be caught.

University of Delaware Operationalized Instructions:

For the last 5' of the walkway, have the patient walk at his/her normal speed again. This way, you can visualize the difference between "slow" and "normal"

(3) Normal: Significant difference between gait speeds is defined as a visible change in speeds compared to the patient's "normal" walking speed. The patient may demonstrate a gait deviation if it was present in Item 1, however it can be no worse than at baseline.

(2) Mild Impairment: Mild gait deviation is defined as any deviation beyond baseline as determined in Item 1. Score this category if a patient has a worsening of a gait deviation present at baseline. However, the patient must stay within the base of support.

(1) Moderate Impairment: Significant gait deviation is defined as any gait deviation that causes the patient to weight shift or have a path deviation outside the base of support. Score this category if the patient only has a significant change in speed in one direction. Score this category if the patient requires supervision.

(0) Severe Impairment: Score this category if the patient requires contact guard assistance, minimum assistance (or more) in order to maintain balance

Test Item 3: Gait with horizontal head turns

Original DGI:

Instructions: Begin walking at your normal pace. When I tell you to “look right,” keep walking straight, but turn your head to the right. Keep looking to the right until I tell you, “look left,” then keep walking straight and turn your head to the left. Keep your head to the left until I tell you “look straight,” then keep walking straight, but return your head to the center.

Grading: Mark the lowest category that applies.

(3) Normal: Performs head turns smoothly with no change in gait.

(2) Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid.

(1) Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.

(0) Severe Impairment: Performs task with severe disruption of gait, i.e., staggers outside 15” path, loses balance, stops, reaches for wall.

University of Delaware Operationalized Instructions:

The patient should look straight for 5’, look right for 5’, look left for 5’ and look straight for 5’.

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.

(3) Normal: No change in gait beyond baseline gait deviations and speed as found in Item 1.

(2) Mild Impairment: Minor disruption to smooth gait is defined as any gait deviation beyond baseline as determined in Item 1. However, the patient must stay within the base of support. A slight change in gait velocity is defined as a visible change in gait velocity with a head turn to only one side.

(1) Moderate Impairment: A moderate change in gait velocity is defined as a visible change in gait velocity with head turns to both sides. Score this category if the patient weight shifts outside base of support, but maintains within the 15” path. Score this category if the patient requires supervision.

(0) Severe Impairment: Score this category if the patient requires contact guard assistance, minimum assistance (or more) to maintain balance. Score this category if the patient is unable to ambulate with head turned to 45 degrees (or through full available cervical range of motion) in either direction.

Test Item 4: Gait with vertical head turns

Original DGI:

Instructions: Begin walking at your normal pace. When I tell you to “look up,” keep walking straight, but tip your head up. Keep looking up until I tell you, “look down,” then keep walking straight and tip your head down. Keep your head down until I tell you “look straight,” then keep walking straight, but return your head to the center.

Grading: Mark the lowest category that applies.

(3) Normal: Performs head turns smoothly with no change in gait.

(2) Mild Impairment: Performs head turns smoothly with slight change in gait velocity, i.e., minor disruption to smooth gait path or uses walking aid.

(1) Moderate Impairment: Performs head turns with moderate change in gait velocity, slows down, staggers but recovers, can continue to walk.

(0) Severe Impairment: Performs task with severe disruption of gait, i.e., staggers outside 15” path, loses balance, stops, reaches for wall.

University of Delaware Operationalized Instructions:

The patient should look straight for 5’, look up for 5’, look down for 5’ and look straight for 5’.

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.

(3) Normal: Performs with no change in gait from baseline as observed in Item 1.

(2) Mild Impairment: Minor disruption to smooth gait is defined as any gait deviation beyond baseline as determined in Item 1. However, the patient must stay within the base of support. A slight change in gait velocity is defined as a visible change in gait velocity with a head turn in only one direction.

(1) Moderate Impairment: A moderate change in gait velocity is defined as a visible change in gait velocity with head turns in both directions. Score this category if the patient weight shifts outside base of support, but maintains within the 15” path. Score this category if the patient requires supervision.

(0) Severe Impairment: Score this category if the patient requires contact guard assistance, minimum assistance (or more) to maintain balance. Score this category if the patient is unable to ambulate with head tipped to 45 degrees (or through full available cervical range of motion) in either direction.

Item 5: Gait and pivot turn

Original DGI:

Instructions: Begin walking at your normal pace. When I tell you, "turn and stop," turn as quickly as you can to face the opposite direction and stop.

Grading: Mark the lowest category that applies.

- (3) Normal: Pivot turns safely within 3 seconds and stops quickly with no loss of balance.
- (2) Mild Impairment: Pivot turns safely in > 3 seconds and stops with no loss of balance.
- (1) Moderate Impairment: Turns slowly, requires verbal cueing, requires several small steps to catch balance following turn and stop.
- (0) Severe Impairment: Cannot turn safely, requires assistance to turn and stop.

University of Delaware Operationalized Instructions:

Use a stop watch to time how long the patient takes to pivot turn. Begin timing when the patient begins turning and stop the time when the patient's feet have both stopped moving.

- (3) Normal: The patient must turn in < 3 seconds and take < 3 steps to turn.²⁵ A step is defined as a foot leaving the floor. The patient must stay within the base of support.
- (2) Mild Impairment: The patient takes > 3 seconds to turn or takes 4-5 steps to turn.²⁵ A step is defined as a foot leaving the floor. The patient must stay within the base of support. Score this category if the patient uses an assistive device.
- (1) Moderate Impairment: The patient requires > 5 steps to turn or steps outside the base of support while turning.²⁵ Score this category if the patient requires supervision.
- (0) Severe Impairment: Score this category if the patient requires contact guard assistance, minimum assistance (or more) to maintain balance.

Item 6: Step over obstacle

Original DGI:

Instructions: Begin walking at your normal speed. When you come to the shoebox, step over it, not around it, and keep walking.

Grading: Mark the lowest category that applies.

(3) Normal: Is able to step over the box without changing gait speed, no evidence of imbalance.

(2) Mild Impairment: Is able to step over box, but must slow down and adjust steps to clear box safely.

(1) Moderate Impairment: Is able to step over box but must stop, then step over. May require verbal cueing.

(0) Severe Impairment: Cannot perform without assistance.

University of Delaware Operationalized Instructions:

Measure the shoebox and standardize it within your clinic.

Place the shoebox at the 10' mark

(3) Normal: Without changing gait speeds is defined as stepping over the shoebox within stride while ambulating. The patient must clear the shoebox with both lower extremities.⁸

(2) Mild Impairment: Score this category if the patient does not step over the shoebox within their stride. Score this category if the patient requires an assistive device.

(1) Moderate Impairment: Mark this category if the patient requires supervision.

(0) Severe Impairment: Mark this category if the patient is unable to clear the shoebox with both lower extremities. Mark this category if the patient requires contact guard assistance, minimum assistance (or more) to maintain balance.

Item 7: Step around obstacles

Original DGI:

Instructions: Begin walking at normal speed. When you come to the first cone (about 6' away), walk around the right side of it. When you come to the second cone (6' past first cone), walk around it to the left.

Grading: Mark the lowest category that applies.

(3) Normal: Is able to walk around cones safely without changing gait speed; no evidence of imbalance.

(2) Mild Impairment: Is able to step around both cones, but must slow down and adjust steps to clear cones.

(1) Moderate Impairment: Is able to clear cones but must significantly slow speed to accomplish task, or requires verbal cueing.

(0) Severe Impairment: Unable to clear cones, walks into one or both cones, or requires physical assistance.

University of Delaware Operationalized Instructions:

Place the first cone 5' away from the start. Place the second cone at the 10' mark.

(2) Mild Impairment: The patient stays within the base of support. Score this category if the patient requires an assistive device.

(1) Moderate Impairment: Significantly slow speed is defined as the patient stopping during the task. Mark this category if the patient's weight shifts outside the base of support. Mark this category if the patient requires supervision.

(0) Severe Impairment: Mark this category if the patient requires contact guard assistance, minimum assistance (or more) to maintain balance.

Item 8: Steps

Original DGI:

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

Grading: Mark the lowest category that applies.

(3) Normal: Alternating feet, no rail.

(2) Mild Impairment: Alternating feet, must use rail.

(1) Moderate Impairment: Two feet to a stair, must use rail.

(0) Severe Impairment: Cannot do safely.

University of Delaware Operationalized Instructions:

Have the patient negotiate ≥ 4 stairs.^{8,25}

Don't provide any cues for handrail use beyond what is stated in the instructions.¹⁶

Mark the lowest category that applies, taking into account the ascent and descent.

(2) Mild Impairment: Mark this category if the patient requires an assistive device.

(1) Moderate Impairment: Mark this category if the patient requires supervision.

(0) Severe Impairment: Mark this category if the patient requires contact guard assistance, minimum assistance (or more) to maintain balance.

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