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Received: 11.06.2025 Revised: 25.07.2025 Accepted: 29.08.2025

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Research Article

Outcome Measures Used in Neurological Physiotherapy: A Scoping Review of Assessment Tools

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Abstract: Accurate assessment of neurological physiotherapy outcomes is fundamental for tracking patient progress, guiding treatment, and ensuring evidence-based care. With the increasing complexity of neurological disorders such as stroke, Parkinson's disease, multiple sclerosis, and traumatic brain injury, the use of reliable and valid outcome measures has gained prominence. This scoping review provides a detailed overview of the assessment tools commonly used in neurological physiotherapy, classifying them using the International Classification of Functioning, Disability and Health (ICF) framework. Outcome measures are categorized under Body Function and Structure, Activity, and Participation, with condition-specific tools discussed in detail. The review identifies gaps in standardization, challenges in selection, and recent trends toward technology-enhanced assessments. Tables are provided for quick reference to tools by category and neurological condition.

Keywords: neurological physiotherapy, outcome measures, stroke, Parkinson's disease, multiple sclerosis, traumatic brain injury, ICF, rehabilitation

1. Introduction

Neurological conditions often result in significant and long-term impairments in mobility, coordination, strength, and balance. These limitations necessitate structured rehabilitation, particularly physiotherapy, which focuses on restoring functional independence and improving quality of life. However, the effectiveness of any physiotherapy intervention must be measured using valid and reliable outcome measures. These tools provide objective data for assessing progress, setting goals, and modifying treatment strategies.

Despite the abundance of outcome measures available, their selection in clinical practice varies greatly. This scoping review aims to provide clarity by identifying widely used tools, examining their clinical application across different neurological

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conditions, and highlighting areas for improvement. This scoping review emphasizes the critical role of outcome measures in neurological physiotherapy for assessing patient progress, guiding interventions, and supporting evidence-based practice. Given the diverse impairments resulting from neurological conditions like stroke, Parkinson's disease, multiple sclerosis, and traumatic brain injury, the need for reliable, valid, and standardized assessment tools is increasingly recognized. However, current clinical practices show wide variation in tool selection and application. This review addresses this gap by mapping existing outcome measures and classifying them using the International Classification of Functioning, Disability and Health (ICF) framework.(1,2)

2. Methodology

A scoping review framework was followed, as per Arksey and O'Malley. Literature from PubMed, PEDro, and Scopus between 2010 and 2024 was searched using keywords such as *neurological physiotherapy*, *assessment tools*, *outcome measures*, and *rehabilitation*.

Inclusion criteria:

- Studies focusing on adult patients receiving physiotherapy for stroke, Parkinson's disease, MS, or TBI.
- Articles that used or evaluated outcome measurement tools.
- English language publications.

Data was organized and presented in narrative format, with tables summarizing key findings.(3)

ICF-Based Classification of Outcome Measures

The ICF framework provides a standard model to assess disability and functioning, dividing health indicators into three domains: Body Functions and Structures, Activities, and Participation.

Table 1: Outcome Measures Classified by ICF Domains

ICF Domain	Tool	Function	Common Use
Body Function & Structure	Modified Ashworth Scale (MAS)	Measures muscle spasticity	Stroke, CP, TBI
	Fugl-Meyer Assessment (FMA)	Assesses motor recovery post-stroke	Stroke
	Manual Muscle Testing (MMT)	Evaluates voluntary muscle strength	General neurological rehab
	NIH Stroke Scale (NIHSS)	Quantifies neurological deficit	Acute stroke
Activity	Timed Up and Go (TUG)	Assesses mobility and fall risk	Stroke, PD, MS
	6-Minute Walk Test (6MWT)	Measures endurance and functional capacity	MS, stroke, PD
	Berg Balance Scale (BBS)	Evaluates static and dynamic balance	Stroke, PD
	10-Meter Walk Test (10MWT)	Assesses gait speed and walking ability	MS, PD, stroke
Participation	Stroke Impact Scale (SIS)	Self-reported impact on daily life and participation	Stroke
	Parkinson's Disease Questionnaire-39 (PDQ-39)	Measures health-related quality of life	Parkinson's disease
	SF-36	General health and social participation	All conditions

Stroke-Specific Outcome Measures

Stroke is one of the most studied neurological conditions in physiotherapy. The use of standardized tools is common in both research and clinical practice.

- **Fugl-Meyer Assessment (FMA)** is considered the gold standard for evaluating sensorimotor recovery.
- **NIH Stroke Scale (NIHSS)** helps quantify stroke severity in acute settings.
- **Barthel Index** and **Functional Independence Measure (FIM)** assess a patient's ability to perform ADLs (activities of daily living).
- For participation, the **Stroke Impact Scale (SIS)** gives a comprehensive view of the stroke's impact on daily life.

These tools allow clinicians to track recovery over time and determine the effectiveness of therapeutic interventions.(4,5,6)

Parkinson's Disease Outcome Measures

In Parkinson's disease (PD), physiotherapy often focuses on gait, posture, balance, and functional mobility. The following tools are commonly used:

- **Unified Parkinson's Disease Rating Scale (UPDRS)** evaluates both motor and non-motor symptoms.
- **Hoehn and Yahr Scale** classifies the disease into five stages, useful for tracking progression.
- **TUG**, **BBS**, and **10MWT** help assess mobility and fall risk.
- **PDQ-39** evaluates health-related quality of life and is essential for measuring patient-perceived outcomes.(7,8,9)

Outcome Measures in Multiple Sclerosis

Multiple sclerosis (MS) is a progressive neurological condition characterized by variable symptoms, requiring sensitive and multidimensional outcome measures.

- **Expanded Disability Status Scale (EDSS)** is widely used but criticized for being insensitive to small changes.
- **MS Functional Composite (MSFC)** is more responsive and includes gait speed, hand function, and cognitive tasks.
- **Fatigue Severity Scale (FSS)** is essential in evaluating one of the most common symptoms in MS.
- Tools like **6MWT**, **10MWT**, and **BBS** help assess mobility, endurance, and balance.(10,11)

Traumatic Brain Injury (TBI)

TBI presents unique challenges due to its heterogeneity. Cognitive, motor, and behavioral symptoms require a combination of tools.

- **Glasgow Coma Scale (GCS)** is used in the acute phase to assess consciousness.
- **Rancho Los Amigos Scale** helps determine levels of cognitive recovery.
- Functional tools such as **BBS**, **TUG**, and **Community Integration Questionnaire (CIQ)** are used in outpatient settings.
- Participation and psychosocial outcomes are increasingly important and assessed with tools like **SF-36** and **CIQ**.(12)

Table of Condition-Specific Tools

Table 2: Common Outcome Measures by Neurological Condition

Condition	Impairment Tools	Activity Tools	Participation Tools
Stroke	FMA, NIHSS, MAS	TUG, 6MWT, BBS	SIS, SF-36
Parkinson's	UPDRS, Hoehn & Yahr	TUG, BBS, 10MWT	PDQ-39, SF-36
MS	EDSS, MSFC, FSS	6MWT, BBS, 10MWT	SF-36, MSIS-29
TBI	GCS, Rancho Scale	BBS, TUG, 6MWT	CIQ, SF-36

3. Discussion

This scoping review reveals the breadth and diversity of outcome measures used in neurological physiotherapy, highlighting the complexity clinicians face when choosing appropriate tools. Outcome measures vary significantly across conditions such as stroke, Parkinson's disease, multiple sclerosis (MS), and traumatic brain injury (TBI). Tools like the Fugl-Meyer Assessment (FMA) and Unified Parkinson's Disease Rating Scale (UPDRS) are condition-specific and widely used, while more general tools such as the Timed Up and Go (TUG) and Berg Balance Scale (BBS) are frequently applied across different patient populations. However, no single tool captures all dimensions of function, emphasizing the need for a multi-dimensional approach to assessment that aligns with the ICF framework.(13,14,15)

A notable trend identified is the predominance of impairment- and activity-level tools in clinical practice, with less frequent use of participation-level measures. Instruments like the Stroke Impact Scale (SIS) and PDQ-39, which assess quality of life and social participation, are often overlooked due to time constraints, lack of familiarity, or difficulty administering them in patients with cognitive impairments. This underuse is concerning, as rehabilitation aims not only to restore physical function but also to enhance the patient's ability to participate fully in daily life. Therefore, a shift toward more holistic assessment strategies that include both objective performance measures and patient-reported outcomes is essential.(16)

Additionally, this review highlights several challenges that limit the consistent use of outcome measures. These include the absence of standardized assessment protocols across clinical settings, limited cultural and linguistic validation of tools, and the difficulty of assessing individuals with cognitive or communication barriers. Emerging digital tools and wearable technologies offer exciting potential to support real-time and ecologically valid assessments but come with their own limitations, such as cost and technological literacy. Moving forward, greater emphasis should be placed on developing accessible, brief, and validated tools tailored to specific neurological populations, while also integrating training and guideline support for clinicians to optimize outcome measure selection and implementation.(17,18)

4. Conclusion

Outcome measures are fundamental to neurological physiotherapy practice. By categorizing and selecting tools according to the ICF domains, clinicians can more holistically assess patient status and progress. While several reliable and valid tools exist, there is a need for more standardized, culturally adaptable, and patient-centered assessments. Future research should continue to refine tools to reflect real-world function and patient goals while integrating new technologies to enhance measurement accuracy and accessibility.(19)

Challenges and Gaps

While many outcome measures exist, physiotherapists face several challenges:

- **Lack of Standardization:** There is no universal set of tools adopted across all neurological conditions, leading to inconsistent assessments.
- **Cultural Validity:** Many tools are not translated or validated in non-English speaking or low-resource contexts.
- **Tool Sensitivity:** Some tools, such as EDSS or Barthel Index, may fail to detect subtle yet clinically important changes.
- **Cognitive Impairments:** Some patients are unable to complete self-reported or performance-based tests due to cognitive deficits.
- **Time and Resource Constraints:** In busy clinical settings, lengthy assessment tools may be impractical.(20,21,22)

Trends and Future Directions

Recent developments point toward more integrated, patient-centered, and technology-driven assessment methods:

- Wearable sensors to measure gait, posture, and activity in real-time.
- Mobile apps and digital platforms for patient-reported outcomes.
- Increased use of ecological assessments that reflect real-life function.

- Development of condition-specific short forms to improve feasibility(23)

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