REVIEW

Multiple Sclerosis Functional Composite

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ABSTRACT

Functional disorders due to multiple sclerosis are evaluated using rating scales. EDSS is a scant which is very inadequate in evaluating cognitive functions, is significantly limited in evaluating upper extremity functions and is highly difficult to repeat. Multiple Sclerosis Functional Composite (MSFC) is considered as a test that has been proposed in recent years in MS clinical trials and can overcome these negative features of EDSS.

Three primary assessment methods were suggested for MSFC (9): 1) 25-step walking, 2) 9-Hole Peg test (9-HPT), and 3) Paced Auditory Serial Addition Test-3 (PASAT-3)

Keywords: Multiple sclerosis, multiple sclerosis functional composite, expanded disability status scale

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Multiple Sclerosis (MS) is the most common chronic inflammatory demyelinating disease of the central nervous system affecting more than 2 million people worldwide (1). Although it is seen among women aged 20–40 two times more often, it may be seen almost in all age ranges (2). After traumas, this disease is the most frequent cause of disability among young adults (3).

It is a multifactorial disease. Inflammation, demyelination and axonal degeneration are the main pathological mechanisms underlying clinical manifestations. However, the etiology is not fully understood. Evidences are exist regarding this is a disease that genetic and environmental factors (past infections, sunlight, vitamin D) play a role together (4).

MS has been evaluated with several rating systems until today. Clinical measures such as Expanded Disability Status Scale (EDSS) or relapse number are still used in clinical practice (5). But these scales have some limitations. They are inadequate in evaluating cognitive functions and significantly limited in evaluating upper extremity functions. Also, the repeatability is insufficient.

Inadequacies in cognitive functions and upper limb functions are related to content of scale; inadequacy in repeatability is caused by being on the basis of quite subjective evaluations rather than being on the basis of numerical measures (6–8).

For this reason, the necessity of introducing a new evaluation method was presented with these conducted studies and a new approach of “Multiple Sclerosis Functional Composite” evaluation was proposed. It is being

suggested for clinical trials related to MS in recent years and it is seen as a test which may overcome these negative features of EDSS (9, 10).

Also, the necessity of this approach to be multidimensional to include hand and arm function; cognitive function; visual function; sensory function; and intestine, bladder and sexual function was suggested.

As a result of meta-analysis of dozens basic studies which had examined these functions, measures of three clinical dimensions (lower extremity and upper extremity function, cognitive functions) met the criteria for inclusion of composite outcome measurement (11, 12) and three variables were proposed as primary measures in Multiple Sclerosis Functional Composite (MSFC) (13):

- 1) Timed 25 Foot Walk;
- 2) 9 Hole Peg Test (9-HPT);
- 3) Paced Auditory Serial Addition Test (PASAT-3 version)

Since these three variables are different from what they actually measure (given time for 9-HPT and Timed 25 Foot Walk except the number of correct answers of PASAT-3), it was necessary to define a logical way of using variables that naturally measure dimensions on different scales; because it is about defining a standard for the aforementioned variables, a Z-score was chosen in this aim. Thus, the results from each of these three tests are transformed into Z-scores and averaged to obtain composite scores for each patients at each time point (14).

STANDARDIZATION OF MSFC IMPLEMENTATION

However, before patient's distance walk, MSFC should be implemented as close as possible to the beginning of the study visit.

1. 25-step walk, first trial
2. 25-step walk, second trial
3. Dominant hand, 9-HPT, first trial
4. Dominant hand, 9-HPT, second trial
5. Non-dominant hand, 9-HPT, first trial
6. Non-dominant hand, 9-HPT, second trial
7. PASAT-3

TIMED 25-FOOT WALK (T25W) TEST

- T25W Test is a quantitative measurement of lower extremity functions.
- Measure the precise time the patient walks 25 feet (~8 meters).
- Average the two consecutive trials.
- It is important to use the same line in the same testing area at each visit as possible.
- This minimizes the risk of distraction from external factors.
- The whole set-up should be ready before the patient arrives.
- If the testing area is also used by the public, potential obstacles in the walk-way should be cleared (15, 16).

9 HOLE PEG TEST (9-HPT)

- 9-HPT is an evidence-based, simple, and relatively quick test that measures upper extremity (hand and arm) function (17).
- It is sensitive to the alterations in the upper extremity functions.
- The test standardized apparatus is a peg board with nine holes and nine pegs to be placed in.
- This test is performed when the patient is sitting.
- The patient is asked to put the pegs in the holes, and when they finish, take them out as fast as they can.
- The test begins when the dominant hand touches the peg, and ends when the last peg is put in.
- The time is measured by the chronometer and is started when the hand touches the sticks and finished when the last stick is placed in the box (18).

PACED AUDITORY SERIAL ADDITION TEST (PASAT)

- PASAT is the predominant component of the MSFC.
- It has been used for the last 50 years to test neurological cognitive functionality, and 30 years in MS patients (19).
- It consists of sixty-one numbers. The patient adds the number they hear to the last number they heard.
- The test is administered to those older than 16 years of age.
- CHIPASAT version is used for children (20).
- The test reliably and consistently measures auditory information processing and speed, executive functions, speaking, working memory, and attention (21, 22).

During 9-HPT and PASAT, nobody else should be allowed in the room other than the medical staff. The technician should know all the details of the test to focus solely on observing the patient and recording the responses/results (23).

Make sure the patient is in a comfortable setting mentally and physically throughout the test. The patient should not be told about their results or given any feedback regarding their performance. In case the patient asks questions, positively reinforcing answers are recommended (10).

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