Validation of the MFM-20, a short form of the Motor Function Measure for children between 2 and 7 years of age with neuromuscular disease

C Payan1, D de Lattre1, D da Castro2, F Giraudot2, C Vullierem2, C Bérard2 and the MFM-20 study group
1Institute of Myology, Pitié-Salpêtrière Hospital, Paris, France; 2Ecole Nationale de Physiothérapie, L’Escale, Department of Paediatric Rehabilitation, Hôpital Civil de Lyon, Lyon, France

Introduction

The Motor Function Measure (MFM) is a recent tool designed for the evaluation of patients with neuromuscular diseases, applicable to all degrees of disease severity in both ambulant and non-ambulant patients. The MFM measures motor function in three functional dimensions: standing position and transfers (13 items), axial and proximal motor function (12 items) and distal motor function (7 items), in patients aged between 6 and 60 years. It has been validated in terms of reproducibility, construct validity, concurrent validity and sensitivity to change over one year [Bérard 05]. However, some clinical trials involve younger children. The MFM is not suited to this population: it is too long, and some items are too difficult in terms of cognitive or motor development. Further, few 6 and 7 year-olds and no younger children were examined in the validation study. The first step was to create and validate a short form of the MFM adapted for children under seven years old.

The first phase was the validation of the MFM-20, a short form of the Motor Function Measure for children under seven years old. The second phase was the validation of the short form in a population of 2-7 year old children with one of the main neuromuscular diseases.

MFM-20 construction: Healthy children study

Four centres (Lyon, Montpellier, Nice, St Etienne) participated in the first phase. 190 children, 96 boys and 94 girls, between 2 and 7 years old (4.5±1.2 years) with no cognitive or neuromuscular disorders were included. Other exclusion criteria were psychomotor delay, recent surgery, or sensory disability. Items were considered for removal if fewer than 80% of children attained the maximal score (3). Average completion time was 18.4±6.3 minutes (range 9 to 41 minutes). There was no significant correlation between completion time and age. Cooperation was rated as optimal in 88% of cases and moderate in 12%. Maximum score was not achieved in >80% of subjects for 9 items (8, 16, 17, 19, 20, 26, 28, 29, 31), particularly those involving fine motor skills and balance. For 3 further items (2, 13, 15) the tasks could not be assessed accurately according to the criteria given in the Reference manual.

These 12 items were therefore removed, and the reduced MFM scale was therefore constituted of 20 items. Their distribution among the 3 dimensions of the scale was approximately maintained: 8 items in dimension 1, 8 in dimension 2 and 4 in dimension 3. Psychometric properties of the MFM-20 remain good: the 3 dimensions are maintained. Reliability is acceptable-to-excellent and the dimensions D1 and D2 are still correlated with the ‘gold standard’ Brooke and Vignos scores. Different diseases show different sub-score profiles (Fig. 2) and the total MFM score decreases with severity as assessed by the CGI (Fig. 3). The distal motor function (D3) remains a separate component even though it was only measured by 4 items. Guidelines for the transition between the child and adult scales are under development.

This study confirms the interest of this paediatric scale, particularly for DMD and SMA, which are best represented. It shows good reliability, construct validity and inter-rater consistency. It is potentially useful in clinical trials and is suitable for multicentric designs. A responsiveness study is ongoing in the same patient sample.

The MFM-20 is the first generic scale which evaluates the global motor capacity of young children (2-7 years old) with major neuromuscular diseases. The time required to complete the scale is shorter than for the MFM-32.

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The study was approved by the Sud-Est II Lyon ethical committee.

CONSTRUCT VALIDITY

The 3 initial dimensions of the scale (D1, D2 and D3) were identified. The internal consistency was excellent for D1 and D2 (0.96 and 0.90 respectively) and acceptable for D3 (0.69).

Factor analysis & Internal consistency

The total score correlated well with the Vignos grade (r=0.84) and the overall severity (r=0.84) assessed by clinicians (VAS), D1 and D2 correlated respectively with the Vignos (r=0.86) and Brooke grades (r=0.69).

Discriminant validity

MFM vs diagnosis (fig. 2): The 3 subscores discriminated the different pathologies studied. The profile of the principal groups are represented in figure 2. D1 (standing and transfers) was impaired in SMA and CMD groups. SMA presented also the lowest D2 score (axial and proximal).

MFM vs CGI severity (fig. 3): MFM total score decreased with severity.

RELIABILITY STUDIES

Intra-rater reliability (N=17) : acceptable to excellent (K=0.37 to 0.94) for all items except n°14 (0.22).

Inter-rater reliability (N=34) : acceptable to excellent (K=0.56 to 1.0) for all items.

ICC coefficients of scores, intra- and inter-rater, all excellent (0.91-0.99).

DISCUSSION - CONCLUSION

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The MFM user’s manual is free and easy to download in many languages (site: www.mfm-nmd.org). Training is necessary.