

Validation of the ABILHAND questionnaire to measure manual ability in children and adults with neuromuscular disorders

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The ABILHAND questionnaire and its administration instructions can be downloaded from www.rehab-scales.org in English, French and Dutch. The website also allows total raw scores for the ABILHAND questionnaire to be converted into a linear measure of activity limitations, according to the Rasch model.

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ABSTRACT

Background Neuromuscular disorders (NMDs) can lead to specific manual disabilities due to hand muscle weakness and atrophy, myotonia or loss of sensory function. The aim of this study was to adapt and validate the ABILHAND questionnaire in children and adults with NMDs using the Rasch model.

Methods This questionnaire contained specific manual activities for children and for adults, as well as common manual activities. 124 adult patients and the parents of 124 paediatric patients were asked to provide their perceived difficulty in performing each manual activity on a three level scale: impossible (0), difficult (1) or easy (2). Items were selected from well established psychometric criteria (ordered categories, equal item discrimination, adequate fit to the Rasch model, lack of redundancy) using the Rasch Unidimensional Measurement Models (RUMM2020) computer programme.

Results The 22 selected items contain four children specific items, four adult specific items and 14 items commonly applicable to both children and adults. They define a unidimensional and linear measure of manual ability and demonstrate continuous progression in their difficulty. The item hierarchy of difficulty was invariant across six patient related factors. The scale exhibited good precision ($r=0.95$) and the 22 items were well targeted to the patients' locations. The ABILHAND measures were strongly related to the ACTIVLIM measures ($r=0.76$) and poorly related to grip strength ($r=0.36$ for the right hand and $r=0.40$ for the left hand).

Conclusion This scale can be used for adults and children, allowing manual ability to be assessed from childhood to adulthood.

INTRODUCTION

Most neuromuscular disorders (NMDs) demonstrate a progressive clinical course that is characterised by a decrease in muscle strength, leading to impaired motor function.¹ The consequences of these diseases include fatigue, locomotion problems and loss of functionality in daily activities. Difficulties associated with performing daily activities are defined by the WHO as activity limitations.² Activity limitations in patients with NMDs can be measured with a new scale, the ACTIVLIM questionnaire. This questionnaire contains 22 items describing global daily activities requiring the use of lower and/or upper limbs, and does not focus on activities that are carried out only using the hands.³ Some patients with NMDs are more prone to

develop clinical patterns such as hand weakness, deformities, loss of sensory function or myotonia, all of which impact on the ability to perform manual activities.^{4–7} This impact may be quantified by evaluating manual ability in patients with NMDs. Manual ability, defined as the capacity to use the hands and upper limbs to perform manual daily activities regardless of the strategies involved,⁸ can be assessed with the ABILHAND questionnaire. This questionnaire was previously validated in patients with chronic stroke,⁹ children with cerebral palsy,¹⁰ patients with rheumatoid arthritis¹¹ and patients with systemic sclerosis.¹² ABILHAND is a self-reported, widely applicable questionnaire. It allows precise and clinically meaningful patient perceptions to be evaluated in a time and cost effective manner. The Rasch model was used to calibrate the ABILHAND questionnaire in these various populations to overcome the limitations of ordinal scales by transformation of the total score into a linear measure.¹³ This transformation allows quantitative evaluation and follow-up of manual ability in different diagnosis groups.

The purpose of this study was to adapt and validate the ABILHAND questionnaire for children and adults with NMDs using the Rasch model.

PARTICIPANTS AND METHODS

Participants

The participants were recruited through the neuromuscular reference centres of two university hospitals, each in a different Belgian language speaking community (Dutch and French). Moreover, 10% of the children came from three centres specialising in NMDs. Adult participants and parents of the included children provided written informed consent before the evaluation. Two hundred and forty-eight consecutive patients (124 children and 124 adults) with a diagnosis of NMD were included in the study. Age, gender, language community and type of NMD were included as independent demographic and clinical indices in the validation analysis. This multicentre study was approved by the medical ethics committees of the Université catholique de Louvain and the Katholieke Universiteit Leuven.

A sample description is provided in table 1.

Adaptation of the ABILHAND to NMD patients

The ABILHAND⁸ and the ABILHAND-Kids¹⁰ questionnaires were used as a starting point to assess the manual ability of adults and children with NMDs.

Table 1 Patient sample description (n=248)

	Adults (n=124)	Children (n=124)
Gender (%)		
Male	56	68
Female	44	32
Age (years) (mean (range))	47 (16–80)	10 (6–16)
Spoken language (%)		
Dutch	37	64
French	63	36
Diagnosis (%)*		
DMD/BMD or LGMD	15	38
HN	19	28
MD	19	
SMA	6	11
FSHD	6	
Others (eg, CM, CMD, PPS, ...)	35	23
Mobility level (%)		
Walking	77	66
Wheelchair	23	34
Physical therapy (%)		
No	36	11
Yes	64	89

*BMD, Becker muscular dystrophy; CM, congenital myopathy; CMD, congenital muscular dystrophy; DMD, Duchenne muscular dystrophy; FSHD, facio-scapulo-humeral dystrophy; HN, hereditary neuropathy; LGMD, limb girdle muscular dystrophy; MD, myotonic dystrophy; PPS, post-polio syndrome; SMA, spinal muscular atrophy.

The original versions of these questionnaires included 56 manual activities for children and 74 manual activities for adults. These activities or items were submitted to 32 experts on patients with NMDs (neurologists, physicians, physical therapists, occupational therapists, nurses and a psychologist). These experts were asked: (1) to determine the relevance of the activities to an adult with NMD or to a child with NMD and (2) to suggest other manual activities not included in the original item set. Following the experts' suggestions, 12 items specific to adults and 21 items specific to children were removed from the questionnaire because the experts considered them to be irrelevant. No items were added to the questionnaires. Therefore, the experimental version of the questionnaire consisted of 44 items (56–12) for adults and 53 items (74–21) for children. Thirty-five items were common to both groups of participants. The adult participants and parents of the included children completed either the adult or child version of the questionnaire. They were asked to provide their perceived difficulty in performing each activity using a three level scale: impossible (0), difficult (1) or easy (2). Each activity could be completed irrespective of the limb(s) and adaptive strategies used. Activities unfamiliar to participants were recorded as missing responses (2.8% of the data).

Procedure

A French or Dutch version of the questionnaire was presented to participants. As shown in a previous study, the parents of the affected children could give more precise responses than their children.¹⁰ Therefore, the questionnaires were completed by the parents of the affected children or by the adult participants themselves either during their multidisciplinary consultation at the neuromuscular centres or at the specialised centres for children with NMDs. The items were randomly presented to each participant to avoid any systematic effect due to item order.

Data analysis

To calibrate a common scale for both children and adults with NMDs, the responses of the parents and those of the adult participants should form a single matrix. As 35 items were common to both questionnaires, nine items were specifically designed for adults and were recorded as missing responses in the dataset obtained for the parents of affected children. Similarly, the 18 items specific for children were recorded as missing responses in the dataset obtained for adult participants. Therefore, the final data matrix included 62 items (35 common to both groups, 18 specific to children and nine specific to adults) that were analysed with the Rasch Unidimensional Measurement Models computer programme (RUMM2020, RUMM Laboratory Pty Ltd, Perth, Western Australia).

The Rasch model

The Rasch model estimates the item difficulty and a patient's manual ability on a common linear scale based on the responses provided for each item within a probabilistic framework.¹³ The manual ability measure is expressed in logits (ie, log odds units), a linear unit defined as the natural logarithm of the odds of successful achievement of any item by a patient. This unit is constant along the measurement scale, and the zero value for the scale is conventionally set as the average difficulty of the entire item set. This model assumes that participants with a higher level of manual ability have a higher probability, relative to participants with a lower ability, to successfully achieve any item.¹⁴ To calibrate and validate the scale, some guidelines for using the Rasch model were followed.¹⁵ These concerned: (1) the response category functioning, (2) the overall fit of the items and the patients to the model, (3) the scale unidimensionality and (4) the sample targeting and the scale reliability.

Category functioning was studied by verifying that the successive response categories for each item (0=impossible, 1=difficult and 2=easy) represented increasing levels of ability and that the thresholds between adjacent categories were located in the expected order. The thresholds correspond to the manual ability required to have a higher probability of selecting a category rather than the previous one. The structure of the item response categories followed the rating scale model in which all items share the same rating scale structure.^{16–17} This model allows an easier clinical interpretation of the scores.

The overall fit of the items and persons to the model was verified by testing how closely the observed data match the model expectations. Individual item fit to the model indicates whether the items contribute to the definition of the unidimensional manual ability construct.¹⁸ To test the unidimensionality of an item, the sample is divided along the variable into level groups called class intervals. For each item, the degree of similarity between the observed responses in each class interval and the expected responses predicted by the model are computed in the software¹⁸ using a standardised residual. The standardised residual is sensitive to the item discrimination. Positive values represent under-discriminating items whereas negative values represent over-discriminating items. The magnitude of the standardised residuals is evaluated via a χ^2 statistic also reported by the software. The χ^2 and its associated p value indicate the probability that the magnitude of the standardised residual was observed by chance.

Targeting was assessed by comparing the mean patient location to the mean item difficulty. The software also reports the reliability index, which indicates the level of measurement precision attained in the sample.

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Item selection

The 62 original items were submitted to a top down analysis in order to construct a unidimensional scale that fits both the children's and adults' perception of manual ability according to the following criteria: (1) an ordered rating scale indicating that the three response categories were well discriminated, (2) discrimination of the three response categories similar to the other items allowing the use of a rating scale model as verified by a non-significant likelihood ratio test,¹⁹ (3) an adequate fit to the Rasch model confirmed by a χ^2 statistic p value greater than 0.05 and standardised residuals between -2.5 and 2.5 ,¹⁹ indicating items contributing to the definition of the unidimensional construct of manual ability and (4) no redundancy in item location and preferably retaining items common to both children and adults in the questionnaire.

Determination of scale invariance through differential item functioning

The invariance of the item difficulty hierarchy was verified with regard to six dichotomous patient related factors: (1) gender (men vs women), (2) patient category (children vs adults), (3) language community (Dutch vs French speakers), (4) type of NMD (proximal NMD, ie, Duchenne muscular dystrophy/Becker muscular dystrophy and limb girdle muscular dystrophy vs distal NMD, ie, hereditary neuropathy), (5) mobility level (ambulant vs wheelchair users) and (6) physical therapy (no vs yes).

Convergent validity

The convergent validity was tested by examining the degree of association between the manual ability measures of patients and other measures: (1) activity limitations assessed by the ACTIVLIM questionnaire³ and (2) grip strength in both hands evaluated with a Jamar dynamometer (Therapeutic Equipment Corporation, Clifton, New Jersey, USA), according to the

procedure described by Mathiowetz and colleagues.²⁰ Moreover, the relationships between the ABILHAND measures of the patients and demographic indices (age, gender and community) and the type of NMD were tested using correlation coefficients for continuous indices and one way analysis of variance for groups of nominal indices. Analyses were performed with SigmaStat software, and a p value <0.05 was considered statistically significant.

RESULTS

Refinements of the ABILHAND scale for children and adults with NMDs

Successive analyses using the Rasch model resulted in selection of 22 items from the original 62 item set. Forty items were therefore removed: one item presented disordered thresholds (ringing a doorbell), 15 items had a different discrimination of the response categories (eg, drawing), 21 items did not contribute to the definition of the unidimensional construct (eg, lacing shoes or throwing a ball) and three items were redundant (eg, peeling a banana). The final ABILHAND scale contained 14 activities common to adults and children (eg, turning on a tap), four activities specific to children (eg, sharpening a pencil) and four activities specific to adults (eg, counting bank notes) (table 2).

Psychometric properties of the ABILHAND scale in children and adults with NMDs

The likelihood ratio test performed for the 22 selected items was not significant ($p=0.63$), allowing the use of a rating scale model. The overall fit statistics reported for the final scale were close to the standardised normal distribution for the fit residuals of the items (mean $\pm$ SD -0.283 ± 0.819) and of the patients (mean $\pm$ SD -0.274 ± 0.939), and the reported item–trait interaction χ^2 test was not significant ($\chi^2=139.75$, $df=170$, $p=0.96$).

Table 2 ABILHAND calibration for adults and children with neuromuscular disorders

Items*	Usually bimanual	Difficulty (logits)	SE (logits)	Residual (z)	Fit (χ^2)	Degrees of freedom†	p Value
a. Taking the cap off a bottle	A x	2.27	0.21	-0.11	2.48	3	0.48
b. Cutting one's nails	A x	2.22	0.21	0.49	1.89	3	0.60
c. Buttoning up a shirt	B x	1.92	0.14	-1.34	6.63	8	0.58
d. Fastening the zipper of a jacket	B x	1.20	0.15	-0.69	5.28	8	0.73
e. Turning a key in a keyhole	B	1.17	0.15	-0.39	6.90	8	0.55
f. Fastening a snap (jacket, bag,...)	B x	1.12	0.15	-0.36	9.65	8	0.29
g. Opening a pack of chips	C x	0.44	0.20	0.40	1.32	3	0.73
h. Opening a pack of biscuits	B x	0.22	0.16	1.00	9.53	8	0.30
i. Inserting a key in a keyhole	A	0.19	0.24	-0.99	2.62	3	0.45
j. Turning off a tap	B	0.08	0.16	-1.93	7.32	8	0.50
k. Turning on a tap	B	-0.02	0.16	-0.87	9.26	8	0.32
l. Filling a glass with water	B x	-0.14	0.16	1.03	6.75	8	0.56
m. Sharpening a pencil	C x	-0.24	0.21	1.07	5.67	3	0.13
n. Opening a bread box	B x	-0.24	0.17	-0.50	2.06	8	0.98
o. Squeezing toothpaste onto a toothbrush	B x	-0.33	0.17	-1.16	7.09	8	0.53
p. Spreading butter on a slice of bread	B x	-0.37	0.17	0.28	5.79	8	0.67
q. Opening a toothpaste tube	B	-0.51	0.17	0.11	10.14	8	0.26
r. Counting banknotes	A x	-1.22	0.30	-0.10	1.92	3	0.59
s. Dealing cards	C	-1.51	0.26	0.33	6.11	3	0.11
t. Unwrapping a chocolate bar	C x	-1.79	0.26	-0.44	0.57	3	0.90
u. Wiping one's hands	B x	-2.23	0.23	-0.81	1.86	8	0.98
v. Washing one's hands	B x	-2.25	0.23	-1.24	6.00	8	0.65

*A, B or C corresponds respectively to an adult, to a common or to a child activity.

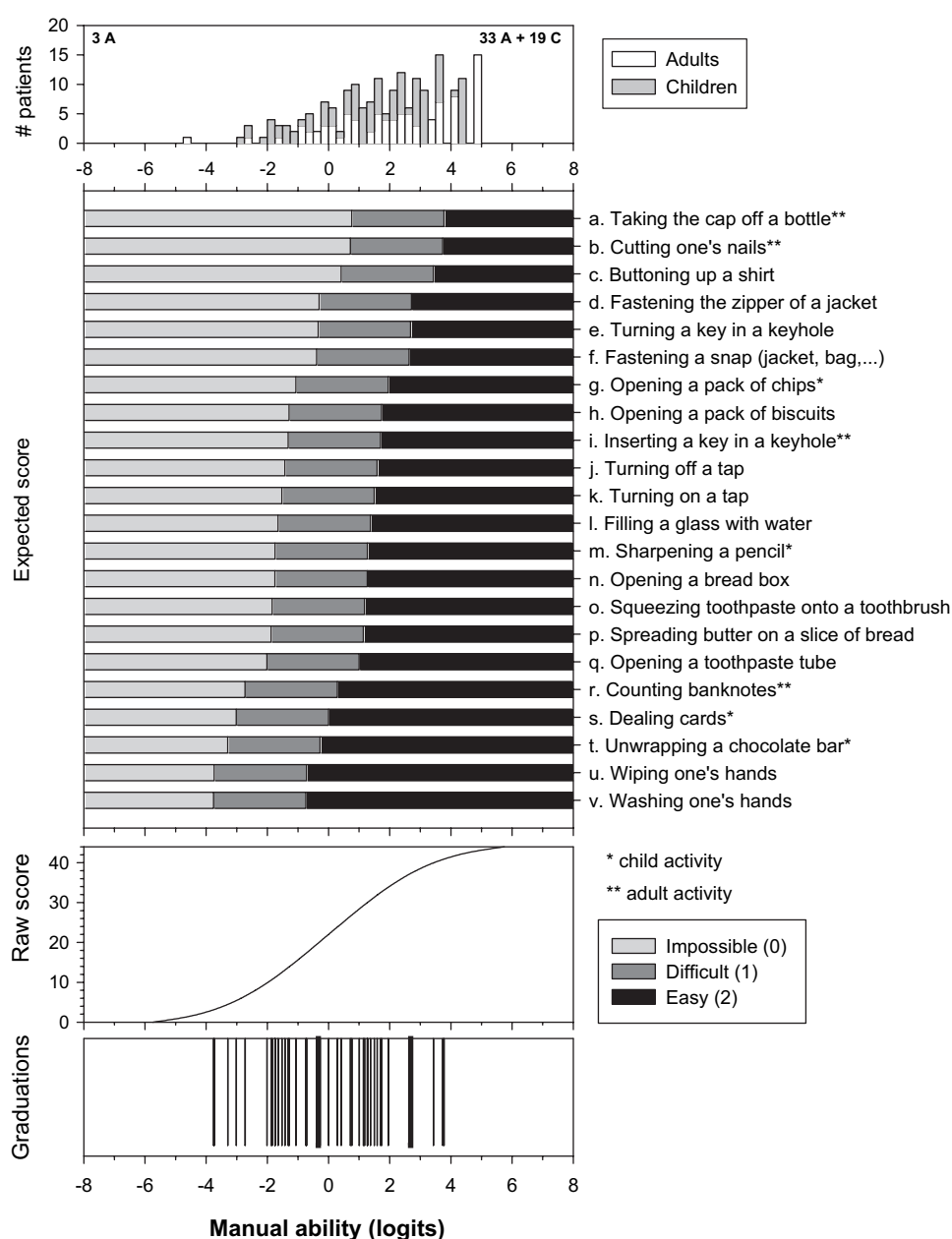
†Degrees of freedom are the number of class interval (CI)—1; the specific items were composed of four CI while the common items were composed of nine CI.

Calibration of the final 22 item ABILHAND scale is presented in table 2. The items are listed from top to bottom by decreasing difficulty (range 2.27––2.25 logits), with higher logit values representing more difficult items. Table 2 also shows the SE of the item difficulty estimates (mean 0.19, range 0.14–0.30), the standardised residual (mean –0.28, range –1.93–1.07), the χ^2 fit statistic (range 0.57–10.14) and the associated p value. All 22 items define a unidimensional scale of manual ability since the p values do not show a significant difference between the observed and expected scores. The reliability index in this sample is equal to 0.95, indicating that six groups of manual ability levels can be statistically distinguished within the patient sample.²¹

Description of the ABILHAND scale

Figure 1 shows the structure and targeting of the final linear ABILHAND scale in NMD patients. The distribution of patient measures is presented in the top panel of figure 1. The mean of the manual ability measures is equal to 2.60 logits (SD 2.47), indicating that the participants tended to report moderate difficulties in performing the manual activities. Indeed, 52 participants (33 adults and 19 children) reported that they could perform all activities easily, and 140 participants (66 adults and 74 children) reported that they could achieve all activities easily or with some difficulty. Only three adult participants reported that they could not perform any of the 22 manual activities.

Figure 1 Structure of the ABILHAND scale in patients with neuromuscular disorders. Top: Distribution of the manual ability measures for the 124 children, as perceived by their parents, and of the self-perceived manual ability measures for the 124 adults. Nineteen children (C) and 36 adults (A) with extreme scores could not be assessed by the ABILHAND scale because all activities were either easy (19 C + 33 A) or impossible (3 A). Upper middle: A patient's expected response to each item as a function of manual ability. Zero is set as the average item difficulty, by convention. The threshold measures between consecutive response categories are located at –1.51 and +1.51 logits from the difficulty of each item. Being able to easily turn off a tap requires a measure of at least 1.59 logits whereas any patient with a measure below –1.43 would be unable to fully accomplish this activity. Conversely, a patient with a measure of 0 logits would be expected to perform the three easiest activities without difficulty, to perform the average activities with some difficulties and to be unable to perform the three most difficult activities. Lower middle: The ogival relationship makes it possible to convert the ordinal raw score into a linear measure of manual ability. The raw scores ranged from 0 to 44 because 22 items demonstrated scores from 0 to 2. The manual ability in logits is an infinite measure. Although this relationship is quasi-linear in its central part, a unitary increment in the total score encompasses larger differences in manual ability at both ends of the scale. Bottom: Scale graduations represented by the 44 thresholds (two thresholds per item). The first graduation corresponds to the manual ability required to endorse 'difficult' rather than 'impossible' for the item 'washing one's hands' and the last graduation represents the manual ability required to select 'easy' rather than 'difficult' for the item 'taking the cap off a bottle'.



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Differential item functioning

The item hierarchy invariance of the 22 selected items was tested across six subgroups of NMD patients using the differential item functioning plots shown in figure 2. As most of the manual activities were within the 95% CI of the identity line, the difficulty of the items tended to be consistently estimated across demographic and clinical subgroups of participants. However, there are some exceptions, which are indicated by labels in figure 2.

Convergent validity

The ABILHAND measures were significantly but poorly correlated with grip strength ($r=0.36$, $p<0.001$ for the right hand and $r=0.40$, $p<0.001$ for the left hand) and age ($r=0.14$, $p=0.03$). The ABILHAND measures were strongly correlated with the ACTIVLIM measures ($r=0.76$, $p<0.001$). No significant differences in manual ability measures were observed between partici-

pants with different language community ($F=0.17$, $p=0.68$), gender ($F=0.65$, $p=0.42$) and type of NMD ($F=2.18$, $p=0.09$).

DISCUSSION

The objective of the present study was to validate a measure of manual ability in both children and adults with NMDs. The ABILHAND questionnaire assesses the difficulties in performing manual activities of daily living and was calibrated for 248 participants using the Rasch model. The 22 items selected for the final version of the questionnaire shared the same ordered rating scale and defined a linear and unidimensional scale.

Only one item was removed due to reversed thresholds, indicating that both the parents of the affected children and the adult participants suitably discriminated the three proposed response categories.²² A large number of items were removed because they did not contribute to the definition of the unidimensional construct of manual ability.²³ Indeed, some items assessed another aspect of activity limitations since they required skills other than manual ability to be performed. For instance, 'lacing one's shoes' requires mobility of the lower limbs and trunk and 'throwing a ball' requires large amplitude movement of the upper limbs.

The hierarchy of the 22 items is consistent with the type of manual involvement required to complete the manual activities. More difficult items require finger strength and digital dexterity (eg, cutting one's nails) while easier items do not require much wrist and finger involvement (eg, wiping one's hands). Moreover, the 22 items seem to be relevant activities that may be used to assess manual ability in patients with NMD since impaired dexterity, hand muscle weakness and atrophy are clinical features observed in these patients.^{6 23 24} Furthermore, the ABILHAND questionnaire was already calibrated for patients with chronic stroke⁹ and rheumatoid arthritis.¹¹ The hierarchy of selected items in these studies can be compared with the hierarchy of the present study. Items such as 'taking the cap off a bottle', 'buttoning up a shirt' or 'fastening the zipper of a jacket' are easier for patients with chronic stroke than for patients with NMD. These activities can be completed using adaptive strategies involving the unaffected hand by patients with chronic stroke while NMD patients often present symmetric impairments.^{1 25–30} Activities such as 'turning a key in a keyhole', 'fastening the snap of a jacket' or 'fastening the zipper of a jacket' are more difficult for patients with NMD than for those with rheumatoid arthritis because they involve fine digital dexterity.

The overall fit statistics obtained for the 22 items demonstrated that the observed data fit the expectations of the Rasch model, as the item and person fit residuals displayed an almost normal distribution. The overall χ^2 statistic was not significant, reflecting the invariance of the item hierarchy across the variable.¹⁵ The differential item functioning plots confirmed the invariance of the item hierarchy across six dichotomous subgroups of patients, despite some outlier items (figure 2). For instance, 'cutting one's nails' (item b) or 'counting bank notes' (item r) were considered to be more difficult for patients with distal NMD than for those with proximal NMD. Indeed, these two manual activities require digital dexterity which is more impaired in patients with distal NMD.⁶ The standard errors associated with the item difficulty estimates conformed to the expectations related to the sample size.³¹ Nevertheless, the standard errors of the easiest items (items r, s, t, u and v) tended to be higher than expected. This can be explained by the small number of participants ($n=17$) demonstrating a manual ability

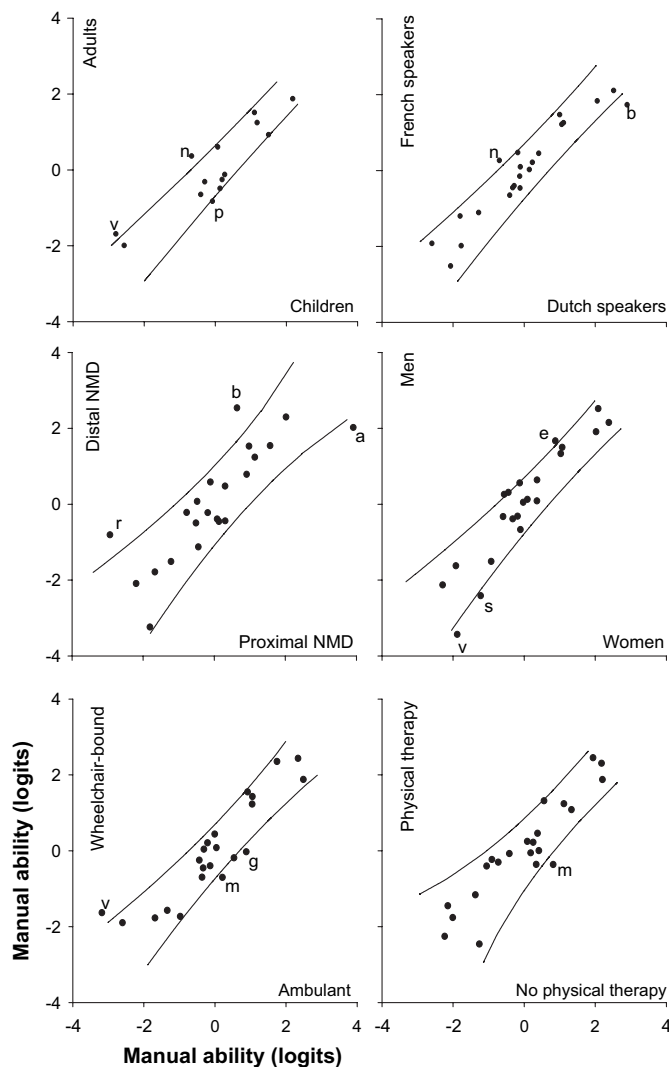


Figure 2 Invariance of the ABILHAND scale among subgroups of patients with neuromuscular disorders (NMDs). Each panel shows the differential item functioning plot for different dichotomous subgroups of patients that were divided according to six splitting criteria. The most difficult items are plotted in the top/right portion of each panel, and the solid lines represent the 95% CI of the ideal invariance. The difficulty of items lying outside the solid lines (identified by their labels shown in table 2) was differentially estimated in both subgroups of patients.

between -1 and -3 logits, leading to decreased measurement precision. Twenty-one per cent of the participants were able to easily complete all the manual activities, indicating a moderate ceiling effect.³² More difficult items included in the original item set allowing reduction of this ceiling effect were removed because they did not contribute to the definition of unidimensional construct of manual ability. Moreover, devising additional items that are difficult, relevant and that specifically involve manual ability without being biased by whole body ability (eg, taking a shower) has turned out to be very challenging. The rest of the sample displayed moderate manual disabilities since their mean location was equal to 1.89 logits. In a previous study, patients with NMDs showed a good level of distal motor function despite their diagnosis.³³ The present study confirms these previous results. In our sample, 26% of patients with a proximal NMD, 20% of patients with a distal NMD, 20% of patients with myotonic dystrophy and 18% of patients with another NMD demonstrated an extreme manual ability score. However, the ABILHAND scale for patients with NMDs presented a good reliability index ($r=0.95$) in our sample, representing more than six groups of significantly different manual abilities.²¹ The 22 items were well targeted to the disabilities of the participants, allowing for assessment of a wide range of manual abilities.

Manual ability is related to activity limitations, as assessed by the ACTIVLIM questionnaire, which conforms to the good convergent validity of the ABILHAND questionnaire in patients with NMD. Participants with higher levels of manual ability tend to also present higher activity levels. Both scales are complementary and do not assess the same variables since only 58% of the variance of the manual ability measures could be explained by the activity limitations measures. The relationship between grip strength and manual ability was poor, indicating: (1) that manual ability is determined not only by this clinical measure but also by other upper limb functions or other factors such as motivation, compensatory strategies or environmental factors,^{2 34–35} and (2) that despite hand muscle weakness, patients can achieve manual activities with no or few difficulties. ABILHAND measures were also significantly but poorly related to the age of participants; the older the patient, the higher was his/her manual ability. This could be explained by the fact that older participants—that is, the adult participants—learnt to develop compensatory strategies after the first signs of disease. Finally, no relationship was found between the ABILHAND measures and the language community, gender or type of NMD. Bérard *et al*³³ also showed that distal function is similarly affected across different NMDs, despite the fact that hand and finger complaints are the first clinical features reported by patients with Charcot–Marie–Tooth neuropathy, myotonic dystrophy or amyotrophic lateral sclerosis.^{4–5 36}

Further applications of the ABILHAND measures include the study of its test–retest reliability and responsiveness. Previous studies on the test–retest reliability of Rasch built measures showed that patients with NMD consistently evaluated themselves after a delay of 1 month³ and that manual ability was invariably self-perceived by different types of patients.^{10–12} These results could suggest that the ABILHAND questionnaire adapted for NMD patients would present a good test–retest reliability. Nevertheless, this finding should be verified. The study of responsiveness is required to use the ABILHAND questionnaire in clinical trials to test the effectiveness of new treatments on manual ability or in research designs to longitudinally describe the evolution of manual ability in patients with NMDs.

In conclusion, the Rasch methodology used in the present study provided a unidimensional and linear scale to assess manual ability in patients with NMDs. The ABILHAND questionnaire also demonstrated excellent precision, validity and reliability in our sample. The item hierarchy was invariant across language community, patient category, gender and type of NMD, indicating that the ABILHAND questionnaire can be used for a wide spectrum of patients with NMDs. Moreover, this scale is common to children and adults, thus allowing the manual ability of patients to be followed from childhood to adulthood. Finally, this self-reported questionnaire is extremely easy and inexpensive to administer since it can be self-completed in the waiting room.

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Competing interests None.

Ethics approval This study was conducted with the approval of the medical ethics committees of the Université catholique de Louvain and the Katholieke Universiteit Leuven.

Provenance and peer review Not commissioned; externally peer reviewed.

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