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PATIENT REPORTED MOBILITY REVIEW

TITLE

PATIENT REPORTED MOBILITY: A SYSTEMATIC REVIEW

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CONFLICTS OF INTEREST

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PATIENT REPORTED MOBILITY: A SYSTEMATIC REVIEW

ABSTRACT

Objective

To identify the self-administered instruments to assess mobility in adults with disability, to link the mobility assessed by these instruments to the International Classification of Functioning, Disability and Health (ICF) and to evaluate their methodological quality.

Data Sources

Scopus, Science Direct and Web of Science were systematically searched up to July 2015.

Study Selection

Studies on the development and validation of self-administered questionnaires in which at least half of the items were related to movement or mobility were included.

Data Extraction

The mobility assessed by the instruments was classified according to the ICF categories. The methodological quality was assessed according to the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) checklist.

Data Synthesis

34 studies out of 5791 papers were eligible for inclusion. Only 10 of the instruments contained items that exclusively assessed mobility. The most frequently linked ICF categories were “changing basic body position” (19.4%), “walking” (14.8%) and “moving around” (13.5%). Measurement properties evaluated included internal consistency (5 studies), reliability (5 studies), measurement error (1 study), content validity (9 studies), structural validity (4 studies), hypotheses testing (6 studies) and responsiveness (1 study). Only content validity obtained the highest quality, probably because the studies included in the review reported the development and initial validation of the instruments.

Conclusions

Self-administered mobility questionnaires published in the scientific literature assess mobility activities rather than functions related to movement, and do so from the perspective of disability, frequently including self-care and domestic life as domains for assessment. The instruments that presented the highest methodological quality were OPTIMAL, MAM and Mobam-in.

Key Words

Disability Evaluation, Mobility Limitation, Outcome Measures, Patient Outcome Assessment, Physiotherapy.

LIST OF ABBREVIATIONS

COSMIN: Consensus-based Standards for the Selection of Health Measurement Instruments.

ICF: International Classification of Functioning, Disability and Health.

ICIDH: International Classification of Impairments, Disabilities, and Handicaps.

IRT: Item Response Theory.

MAM: Movement Ability Measure.

Mobam-in: Mobility Activities Measure for Inpatient Rehabilitation Settings.

OPTIMAL: Outpatient Physical Therapy Improvement in Movement Assessment Log.

PRO: patient reported outcomes.

VAS: visual analogue scale.

INTRODUCTION

The use of measurement instruments in rehabilitation and physical therapy is essential to ensure an adequate scientific basis and quality care[1,2]. Of particular importance among existing instruments are those that collect information provided directly by patients, i.e. patient reported outcomes (PRO)[3]. These measures are useful in the areas of healthcare, management and research in order to design plans of care, improve communication with patients[4], determine patients' perspectives on the benefits provided by an intervention[5] or evaluate the effect of an intervention in clinical trials[1].

One way to collect information on self-perceived health is through the administration of self-report questionnaires. In the field of functional outcomes, self-report measures have proven to be as valid as performance-based measures[6,7] and present less administration bias[8].

Movement is one of the constructs that must be assessed in rehabilitation by means of different measures. Movement is usually measured by objective and quantitative measurements, but can also be assessed from the perspective of the patient[9]. Measuring movement from this perspective is of particular interest in rehabilitation, because movement can be conceptualized as a continuous construct that combines pathological and physical aspects with social and psychological factors[10].

Within the framework of the International Classification of Functioning, Disability and Health (ICF)[11] of the World Health Organization (WHO), movement can be considered both as a body function and as a domain within the activities and participation component, referred to here as “mobility”. As a body function, movement is included in the domain of “Neuromusculoskeletal and movement-related functions” and refers to the functions of movement and mobility of joints, bones, reflexes and muscles. As part of the activities and participation component, mobility is the domain that refers to certain life areas related to “*moving by changing body position or location or by transferring from one place to another, by carrying, moving or manipulating objects, by walking, running or climbing, and by using various forms of transportation”*[11]*.* Movement, understood as a body function or as a task or activity of daily living, can determine whether a person relates positively or negatively to his or her environment. When the outcome of an interaction between an individual's movement and his or her environment is positive, this is classified in the ICF as "functioning". Thus, functioning is a generic term that encompasses body functions and structures, activities and participation. In contrast, when the outcome of an interaction between a person's movement and his or her surroundings is negative, this is termed "disability".

Previous reviews on functional status assessment measures have been oriented towards the analysis of generic outcome measures[12,13], measures specific to a particular health condition[14-19] and measures specific to a particular body area[20-25]. In the field of mobility assessment, Dawson et al[26] conducted a review of outcome measures of function or mobility in patients with spinal cord injury, including all measures, not only self-report ones, in the review. Also in connection with mobility assessment in neurological patients, Mudge et al[27] conducted a review on outcome measures in patients with stroke, but did not focus on self-report measures and the concept measured was just related to walking ability. Morton et al[28] conducted a review of mobility measures in hospitalized older acute medical patients, but their study only included measures based on examiner observation. In the field of rehabilitation, it is essential to study the mobility of patients from their own perspective, but no reviews were identified on rehabilitation functional outcome instruments that specifically assessed self-reported mobility or movement.

The objectives of this study were: 1) to identify and describe the self-report measures published in the scientific literature that assess movement or mobility-related activities in adults with disability, 2) to link the mobility assessed by these instruments to the ICF and 3) to assess the methodological quality of the studies related to mobility assessment measures.

METHODS

Data Sources and Searches

Up to July 2015, electronic searches were conducted in the following databases: Scopus, Science Direct and Web of Science (which includes Medline, Current Contents

Connect, Derwent Innovations Index, SciELO Citation Index and the main Web of Science collection). The search terms were “self-report instrument”, “outcome measures”, “questionnaires”, “measures”, “index”, “scale”, “physical therapy”, “physiotherapy”, “activity limitations”, “mobility assessment”, “disability evaluation”, “functional”, “mobility” and “rehabilitation”, using the search strategy shown in Table 1. Manual searchers were also conducted to identify studies cited in the papers detected in previous searches. RefWorks reference management software package was used to detect duplicates.

[table 1]

Study Selection

The main eligibility criteria was that the studies should concern the development and/or validation of self-administered questionnaires or instruments in which the main construct assessed was related to movement or mobility. Thus, we only included studies in which at least half of the instrument's items (50%) were related to this construct. The included studies were further restricted to those on adults that analyzed psychometric properties and were written in English. No restrictions were imposed regarding date of publication.

The review process was conducted in three stages and involved two independent researchers. Once duplicates had been removed, the first stage consisted of reading the titles and abstracts in order to eliminate experimental, analytical, descriptive and/or reviews studies. Studies on validation of questionnaires or scales in which the main construct assessed was not related to disability, activity limitation or movement-related functions were excluded. Those studies related to performance-based

measures, questionnaires or scales specifically intended for children and/or adolescents and item banks constructed from other existing questionnaires or ICF core sets were also eliminated.

The second stage consisted of reading the complete texts to further eliminate studies on questionnaires or instruments which had already been validated (abbreviated formats or new versions of already validated questionnaires). We analyzed a single validation study for each of the mobility instruments identified, selecting studies that reported the initial instrument development process since we considered this an objective criterion that would yield the most relevant information for our study.

In the third and final stage, we eliminated all those studies that did not meet the criterion where by at least 50% of the items should be related to mobility or movement.

Data Extraction and Synthesis

For data extraction, a form was drawn up for use by two independent researchers, in which they recorded data on the year of publication, author, study sample, measurement instrument name, number of items, concepts measured by the instrument, response options, health condition for intended use, theoretical model on which the instrument was based and the ICF domains explored.

For each of the instruments, the ICF domains explored were quantified as percentages. We analyzed the domains identified in the ICF, according to the One-Level Classification[11], for each of the components. By way of example, within the component of activities and participation, we analyzed the domains: learning and applying

knowledge, general tasks and demands, communication, mobility, self-care, domestic life, interpersonal interactions and relationships, major life areas and community, social and civic life. Mobility-related items were coded according to the ICF Two-Level Classification system applying the rules reported by Cieza et al[29,30] for linking health status measures to the ICF.

Quality Assessment

Quality assessment was only performed on those studies concerning instruments in which all the items were related to mobility. The scoring system proposed in the Consensus-based Standards for the Selection of Health Measurement Instruments (COSMIN) checklist with a 4-point scale was used for this appraisal[31]. This checklist provides the possibility of evaluating nine measurement properties (internal consistency, reliability, measurement error, content validity, structural validity, hypotheses testing, cross-cultural validity, criterion validity and responsiveness) by means of a series of items that vary between 5 and 18. Each of the items on the checklist was rated according to a 4-point rating scale: excellent, good, fair or poor. This rating was used to obtain a separate score for each measurement property in each study by taking the lowest rating of the items to that measurement property (worse score counts). These analyses were performed by three independent researchers, who reached subsequent consensus by comparing their results.

To conduct the review, we followed the recommendations given in the PRISMA declaration[34] (Preferred Reporting Items for Systematic Reviews and Meta-Analyses).

RESULTS

175 The searches resulted in 5791 records, of which 5752 were obtained in the main
176 search (Web of Science, 4708; Science Direct, 392; Scopus, 652) and 39 were located
177 manually in the same databases or in PubMed. Duplicates (N=1439) were discarded via
178 RefWorks.

179 In the first stage of the review, 4216 papers were identified that did not meet the
180 inclusion criteria, and these were eliminated. Therefore, the 136 articles remaining
181 after the first stage concerned self-administered instruments or questionnaires about
182 disability, activities, participation and/or movement-related functions. In the second
183 stage, articles referring to questionnaires or instruments which had already been
184 validated and were reported by another article included in the review were excluded
185 (N=38). In the third stage of the review, only those instruments in which at least 50%
186 of the items or questions were related to limitation of mobility activities or movement-
187 related functions were selected, yielding a final total of 34 studies. Since one of the
188 instruments, the Late-Life Function and Disability Instrument (LLFDI), was composed of
189 two scales, it was reported in two different articles[32,33]; however, these were
190 considered as a single study for the purposes of this review. The flow diagram used for
191 the review process and based on the PRISMA statement[34] is shown in Figure 1.

192 [figure 1]

193 The 34 studies included in the review were published between 1980 and 2014. Most of
194 them (28 studies) were related to condition-specific instruments, the most frequent of
195 which were those related to the assessment of adults with disorders of the lower limb
196 and spine. Only 6 studies were generic, i.e., applicable to any population group (see
197 Table 2).

198 [table 2]

199 Given the inclusion criteria, all the instruments reported in the studies were self-
200 administered. Three of the instruments were administered in a visual format: the
201 Spinal Function Sort[38], administered by means of 50 picture cards, the Mobility
202 Assessment Tool[60], which uses 10 computer-administered videos, and the Animated
203 Activity Questionnaire[66], in which 7 activities are assessed by means of 23 computer-
204 administered videos. Only two questionnaires[39,40] offered response options in visual
205 analogue scale (VAS) format. Most questionnaires offered 5 or 6 response options or a
206 dichotomous (yes/no) option (see Table 2).

207 An analysis of each instrument in accordance with the ICF framework revealed that in
208 16 of the 34 studies (47%), the conceptual model was based on WHO international
209 classifications, although 5 of these (the earliest ones) were based in the International
210 Classification of Impairments, Disabilities, and Handicaps (ICIDH)[68] and 11 on the ICF[11]
211 (Table 2). The remaining 18 studies were not based on WHO international
212 classifications.

213 Table 2 shows the constructs assessed by each instrument in terms of function and
214 disability. In those instruments which gave a higher score the greater the level of
215 difficulty in performing activities or the greater the limitation of activities, the concept
216 to measure is classified as “disability”. In those instruments which gave a higher score
217 the lower the level of disability or the greater the functionality, the concept to
218 measure is classified as “functioning”. In addition, the construct to measure as termed
219 by the author in his or her publication is shown in parentheses. The results indicate

220 that 19 (56%) of the 34 instruments assessed disability, while the remaining 15 (44%)
221 assessed function.

222 The results for quantification of the ICF domains measured by the questionnaires are
223 shown in Table 3. Of the 34 instruments, 19[32,33,38,40,44,46,48,51,52,54-61,63,65-67] exclusively
224 assessed domains related to the activities and participation component. A further 10
225 measures also assessed aspects related to the body functions component, specifically
226 in the domains of mental functions (especially sleep)[35,36,41,42,45,47], sensory functions
227 and pain[35,36,41,62], neuromusculoskeletal and movement-related functions[39,41,49] and
228 functions of the cardiovascular, haematological, immunological and respiratory
229 systems[37]. Only 2 of the questionnaires[43,50] contained questions related to the
230 environmental factors component.

231 Four studies contained the minimum percentage (50%) of mobility-related items
232 required for inclusion in this review, and 10 studies concerned instruments exclusively
233 (100%) related to the assessment of mobility activities (Table 2). After mobility, the
234 two most frequently assessed domains in questionnaires were self-care and domestic
235 life, included in 58.8% and 47.1% of the questionnaires, respectively. The results for
236 the domains assessed by the instruments are shown in Table 3.

237 [table 3]

238 The results of linking mobility-related items to the ICF are presented in Table 4. The
239 total number of questionnaire items was 804, of which 610 were related to mobility or
240 movement. These 610 items were coded in 614 categories, of which the vast majority
241 were linked to the mobility domain, and only 8 (1.3%) were linked to the “joint and
242 bone function” category. The most frequently linked categories were “changing basic

243 body position" (19.4%), "walking" (14.8%) and "moving around" (13.5%). There was
244 only one instrument, the Movement Ability Measure (MAM)[56], which could not be
245 classified according to the ICF categories. Although all the items in the MAM are
246 related to movement, they were coded as "not covered by ICF" since according to the
247 linking rules established by Cieza et al[30], when an item is not a personal factor and it is
248 not contained in the ICF, it should be classified as "not covered by ICF".

249 [table 4]

250 In instruments specifically intended for adults with disorders of a particular body area,
251 items tended to be associated mainly with one or two blocks of categories. In those
252 intended for adults with lower limb disorders[43,44,46,50,51,53], items tended to be related
253 above all to categories in the "walking and moving" block and to the category of
254 "changing basic body position". Meanwhile, items in the two instruments intended for
255 assessment of the upper limb[41,49], which specifically assessed the shoulder, were
256 linked to the categories of "lifting and carrying objects" and "hand and arm use". It is
257 also interesting to note that both instruments additionally contained items in the
258 category "mobility of joint functions". In the instruments specifically intended for spine
259 assessment[35,36,38,42,45,47,48,65], most of the items were related to categories in the
260 "changing and maintaining body position" block and the "carrying, moving and
261 handling objects" block, and contained fewer items associated with the "walking and
262 moving" block. In contrast, the remaining instruments encompassed a wider range of
263 categories.

264 **Quality Assessment**

Methodological quality was evaluated for the 10 studies that were exclusively related to mobility assessment. Three of these studies[44,52,66] employed the Classical Test Theory (CTT) method, five[51,54,56,58,60] used the Item Response Theory (IRT) method, and two[61,67] employed both methods. The most frequently studied measurement properties were content validity and construct validity. All studies except one[66] analyzed at least one measurement property related to reliability and two measurement properties related to validity. Measurement properties evaluated included internal consistency (5 studies), reliability (5 studies), measurement error (1 study), content validity (9 studies), structural validity (4 studies), hypotheses testing (6 studies) and responsiveness (1 study). Responsiveness was only analyzed in one study[52]. Only content validity obtained the highest quality (excellent), in 6 of the 10 studies. These results are shown in Table 5.

[table 5]

DISCUSSION

Self-administered questionnaires intended for mobility assessment and published in the scientific literature between 1980 and 2014 encompass assessment of both specific and generic health conditions, although those destined for the assessment of adults with disorders of the lower limb and spine were the most frequent. The results indicate that the construct of mobility assessed by self-administered questionnaires seems to be more related to mobility as a life area (activity/participation), associated with whole body mobility in relation to space, rather than to the movement of different body parts in relation to each other (body function). In fact, the most

frequently assessed categories ("changing basic body position", "walking" and "moving around") refer to whole body mobility in relation to space.

Interestingly, the studies published after 2004 tended to exclusively assess aspects of the activities/participation component, whereas earlier studies conducted a combined assessment of activities/participation, function and other aspects. Publication in 2001 of the ICF[11] has provided a common conceptual framework and has had a homogenising effect on the language used, although not all instruments published since that date have been based on this international classification. Thus, we observed that all studies published before 1994 assessed in terms of disability, giving higher scores the greater the limitations on activity or restrictions on participation. It was not until after 1994 that studies assessing functioning begin to appear. Nevertheless, the first approach predominated (56%) in the studies included in this review.

It is thus worth noting that after mobility, the domains most frequently assessed by the instruments analyzed were self-care and domestic life. These domains of self-care and domestic life, also commonly known as basic activities of daily living and instrumental activities of daily living, are strongly related to the study of disability and/or functional status[69,70]. These activities of daily living are often studied together with mobility in research related to the evolution of disability[71,72]. Therefore, the questionnaires included in this review assessed mobility as part of a more general assessment of disability. As indicated by Medina-Mirapeix et al[61], it is remarkable that more research does not exist which bases rehabilitation outcomes on mobility activities. In fact, only 10 of the 34 studies in our review contained items that were exclusively (100%) related to mobility.

The clinical implications of this study are related to use of the ICF and the COSMIN checklist as analytical tools. In line with the other studies consulted[73-74], the ICF was found to be a useful tool when comparing health-related measures.

We must also remember that evidence-based rehabilitation practice needs to use sensitive, valid and reliable functional outcome instruments[2]. In our review, the studies that presented the highest methodological quality and analyzed a greater number of psychometric properties were the OPTIMAL (Outpatient Physical Therapy Improvement in Movement Assessment Log)[52], the MAM[56] and the Mobam-in (Mobility Activities Measure for Inpatient Rehabilitation Settings)[67] studies. The OPTIMAL instrument[52] consists of two scales (difficulty and confidence) designed for an adult outpatient population receiving physical therapy. The MAM instrument[56] has 6 dimensions (flexibility, strength, accuracy, speed, adaptability and endurance) and was validated by means of the IRT with a heterogeneous sample of adults. The Mobam-in instrument[67] is based on 5 mobility activity domains and was developed for inpatients receiving postacute rehabilitation care. Both the OPTIMAL and the Mobam-in are based on the ICF and all their items refer to mobility actions within the activities and participation component of the international classification. With the OPTIMAL instrument, respondents are asked to assess their difficulty and confidence in performing each of the activities (*"Please circle the level of difficulty you have for each activity today"* and *"Please circle the level of confidence you have for doing each activity today"*), whereas with the Mobam-in instrument, they are asked to assess difficulty in carrying out activities (*"How much difficulty do you currently experience - without any help from another person or device- when pursuing the following activities?).* In contrast, the MAM instrument falls within the framework of the

334 Movement Continuum Theory of Physical Therapy described by Cott et al[10], and
335 respondents are asked about their present ability to move ("now") and desired ability
336 to move ("would like") for each of the questions (*"In each box, choose the statement*
337 *that comes closest to your usual ability to move now, this week, and the statement that*
338 *comes closest to the ability you would like to have even if you had to work hard for it"*).
339 All three are generic instruments that use self-reports to assess movement. The
340 advantages of this type of generic measure is that they can be applied to people with
341 any kind of disability, enabling comparisons between different health conditions;
342 however, they are generally considered to possess a lower capacity to detect clinically
343 significant changes[75]. Nevertheless, all three instruments were designed for clinical
344 application in the field of rehabilitation. The MAM and the Mobam-in instruments are
345 oriented towards assessing functionality, since the greater the patient's self-reported
346 mobility, the higher the score. In contrast, the OPTIMAL instrument is oriented more
347 towards disability, yielding higher scores the greater the difficulty or the less
348 confidence reported in performing movements. The advantage of the OPTIMAL
349 instrument is that it asks respondents to identify the 3 activities he or she would most
350 like to be able to do without any difficulty, which can be used to design patient-
351 centred rehabilitation goals.

352 **Study Limitations**

353 The main limitations of our findings must be recognized. We did not conduct an
354 analysis of the methodological quality of all the 34 studies included in the review. In
355 our methodological quality analysis, we only considered those studies exclusively
356 related to mobility assessment, since the objectives of this study were specifically

linked to the construct of mobility and not to functioning or disability in general. In future research, it would be interesting to analyze the methodological quality of all validation studies on self-report mobility instruments, even including those that contain more questions about activities of daily living than about movement.

Another limitation of the study resides in a possible selection bias, since we only selected the first validation or questionnaire design studies. This may have influenced that fact that the measurement property which presented the highest quality was content validity, while other properties were not explored. Future lines of research could include an analysis of all all published validation studies on each questionnaire and all shortened or modified versions of the original instruments.

CONCLUSIONS

34 self-reported instruments about mobility were identified in this systematic review. Only 10 of these measures were exclusively (100%) related to the assessment of mobility activities. Most of the instruments were related to the assessment of adults with disorders of the lower limb and spine. After mobility, the two most frequently assessed domains were self-care and domestic life. The instruments that presented the highest methodological quality were OPTIMAL, MAM and Mobam-in.

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TABLE 1. Search strategy.

TABLE 2. Classification of the instruments described in the studies included in the systematic review.

TABLE 3. ICF domains assessed by questionnaires, besides mobility.

TABLE 4. Results of linking mobility-related items to the ICF.
Categories with no associated items have been excluded.

TABLE 5. Methodological quality, in accordance with the COSMIN checklist with a 4-point scale[31], of studies on instruments exclusively related to mobility assessment (cross-cultural validity was excluded since none of the studies analyzed this property).

FIGURE 1. Flow diagram based on the PRISMA statement[34].

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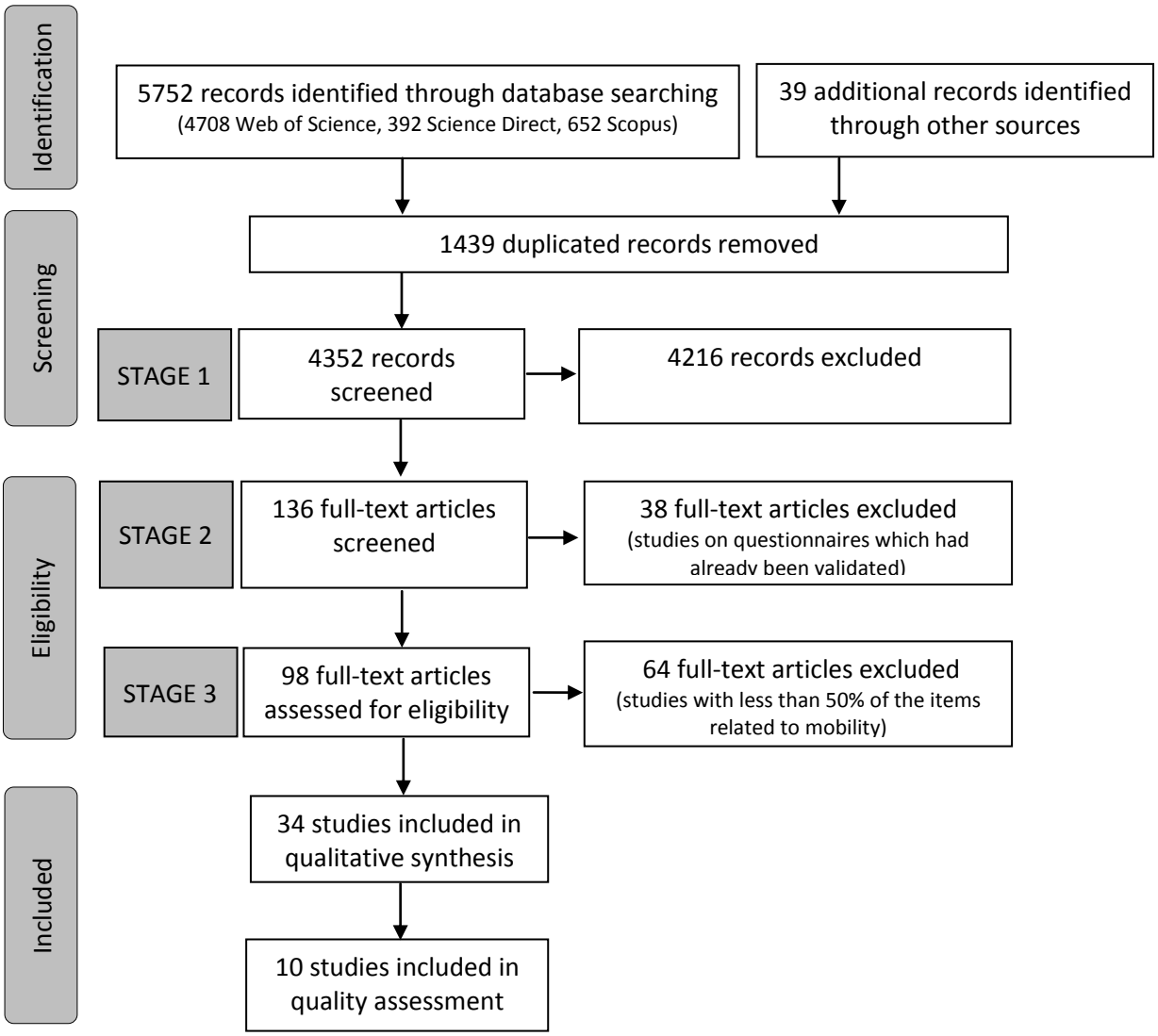

Databases	Search strategy
Web of Science (includes Medline, Current Contents Connect, Derwent Innovations Index, SciELO Citation Index and the main Web of Science collection).	Topic: ("self-report instrument") AND Topic: ("physical therapy" OR physiotherapy) Topic: ("outcome measures" OR questionnaires) AND Topic: ("activity limitations"). Topic: ("outcome measures" OR questionnaires) AND Topic: ("mobility assessment"). Topic: (measures) AND Topic: ("disability evaluation") AND Topic: (rehabilitation). Title: (functional) AND Topic: (mobility) AND Title: (index OR scale).
Science Direct	TITLE-ABSTR-KEY("self-report instrument") and TITLE-ABSTR-KEY("physical therapy" OR physiotherapy). TITLE-ABSTR-KEY("outcome measures" OR questionnaires) and TITLE-ABSTR-KEY("activity limitations"). TITLE-ABSTR-KEY("outcome measures" OR questionnaires) and TITLE-ABSTR-KEY("mobility assessment"). TITLE-ABSTR-KEY(measures) and TITLE-ABSTR-KEY("disability evaluation" AND rehabilitation). TITLE-ABSTR-KEY(functional AND mobility) and TITLE(index OR scale).
Scopus	TITLE-ABS-KEY("self-report instrument") AND TITLE-ABS-KEY(physiotherapy OR "physical therapy"). KEY("outcome measures" OR questionnaires) AND KEY("activity limitations"). (TITLE-ABS-KEY("outcome measures" OR questionnaires) AND TITLE-ABS-KEY("mobility assessment"). KEY(measures) AND KEY("disability evaluation") AND KEY(rehabilitation). TITLE(functional) AND TITLE-ABS-KEY(mobility) AND TITLE(INDEX OR scale).

TABLE 1. Search strategy.

Year	Author	Instrument	Items	Sample	Concepts being measured	Answer choices	Health condition for intended use	ICF framework	Mobility being measured (%)
1980	Fairbank et al[35]	Oswestry Disability Index (ODI)	10	n=25 Sex= NR* Age=NR	Disability (disability due to back pain)	6 (0-5)	Low back pain	No	50
1983	Roland et al[36]	Roland Morris Disability Questionnaire (RMDQ)	24	n= 230 Sex=53% women Age, mean (range)= 40.6 (16-64)	Disability (disability due to back pain)	2 (yes-no)	Low back pain	No	50
1988	Dougados et al[37]	Dougados Functional Index (DFI)	20	n=80 Sex= NR Age=NR	Disability (functional disability)	3 (yes with no difficulty, yes with difficulty, no)	Spondyloarthropathy	No	70
1993	Matheson et al[38]	Spinal Function Sort	50	n= 180 Sex= 30% women Age, mean±SD= 37.0±9.9	Disability (ability to perform work tasks that involve the use of the spine)	6 (1 able – 5 unable - I don't know)	Spinal disorders	No	70
1994	Calin et al[39]	Bath Ankylosing Spondylitis Functional Index (BASFI)	10	n=163 Sex= 25% women Age, mean±SD= 47.7±11.13	Disability (functional ability)	VAS† (easy-impossible)	Ankylosing spondylitis	No	70
1994	Salen et al[40]	Disability Rating Index (DRI)	12	n=1458 Sex= 52% women Age, range= 17-85	Disability (physical disability)	VAS (without difficulty-not at all)	Generic	No	58.3
1995	Matsen et al[41]	Simple Shouder test (SST)	12	n= 103 Sex=25% women Age, mean±SD= 63.0±13.0	Functioning (function of the shoulder)	2 (yes-no)	Primary glenohumeral degenerative joint disease	No	58.3
1996	Kopec et al[42]	Quebec Back Pain Disability Scale	20	n=242 Sex= 50,4% women Age, median=42 (rough median)	Disability (functional disability)	11 (0 not difficult at all - 10 extremely difficult)	Back pain	Yes (ICIDH)	75

1996	Roorda et al[43]	Questionnaire Rising and Sitting Down (QR&S)	32	n=345 Sex= 57% women Age, mean±SD= 52.0±21.0	Disability (functional limitations in rising and sitting down)	2 (yes-no)	Lower-extremity orthopedic or rheumatologic disorders	No	87,5
1998	Gauthier et al[44]	Locomotor Capabilities Index (LCI)	15	n= 70 Sex= 31% women Age, mean±SD= 59.5±17.2	Functioning (locomotor abilities)	4 (0 no - 3 yes, alone)	Lower limb amputee with prosthesis	Yes (ICIDH)	100
1998	Williams et al[45]	Functional Abilities Confidence Scale (FACS)	15	n=94 Sex= 27% women Age, mean±SD= 37.0±11.0	Functioning (self-confidence)	11 (0% not at all confident-100% completely confident)	Low back pain	Yes (ICIDH)	93,3
1999	Binkley et al[46]	Lower Extremity Functional Scale (LEFS)	20	n=107 Sex=56% women Age, mean±SD= 44.0±16.2	Functioning (lower-extremity functional status)	5 (0 extreme difficulty or unable to perform activity - 4 no difficulty)	Lower-extremity orthopedic conditions	Yes (ICIDH)	75
2000	Stratford et al[47]	Back Pain Functional Scale (BPFS)	12	n=77 Sex=61% women Age, mean (range)= 44 (18-79)	Functioning (functional status)	6 (0 unable to perform the activity - 5 no difficulty)	Low back pain	Yes (ICIDH)	58,3
2001	Hägg et al[48]	General Function Score (GFS)	9	n=297 Sex=51% women Age, mean (range)= 45 (25-65)	Disability (physical disability)	3 (can perform-cannot perform, due to low back pain)	Low back pain	No	77,8
2002	Jette et al[32] and Haley et al[33]	Late-Life Function and Disability Instrument (LLFDI)	48	n=150 Sex= 77,3% women Age, mean±SD= 75.9±8.5	Functioning (disability and physical function)	Disability: 5 (1 never-5 very often; 1 completely - 5 not at all). Function: 5 (1 cannot do - 5 none)	Older adults	Yes (ICF)	54,2
2003	Cook et al[49]	Flexilevel Scale of Shoulder Function (FLEX-SF)	33	n=200 Sex= 47% women Age, mean±SD=	Functioning (shoulder function)	6 (0 I can't do this - 4 no difficulty - not	Shoulder complaints	No	78,8

				52.0±16.0		applicable)			
2003	Ryall et al[50]	Special Interest Group in Amputee Medicine (SIGAM) mobility grades questionnaire	21	n=200 Sex=28% women Age, mean±SD= 57.2±17.7	Functioning (mobility)	2 (yes-no)	Lower limb amputee	No	81
2004	Roorda et al[51]	Climbing Stairs Questionnaire	15	n=759 Sex=52% women Age, mean±SD= 59.8±15.0	Disability (limitations in climbing stairs)	2 (yes-no)	Lower-extremity disorders	No	100
2005	Guccione et al[52]	Outpatient physical therapy improvement in movement assessment log (OPTIMAL)	44	n=360 Sex=62% women Age, mean±SD= 50.5±17.3	Disability (ability to perform mobility actions: difficulty and confidende)	Difficulty: 6 (1 able to do without any difficulty -5 unable to do-9 not applicable). Confidence: 6 (1 fully confident in my ability to perform-5 not confident in my ability to perform-9 not applicable)	Generic	Yes (ICF)	100
2005	Martin et al[53]	Foot and Ankle Ability Measure (FAAM)	29	n= 1027 Sex=61,2% women Age, mean±SD= 42.0±17.39	Functioning (physical function: activities of dailly living and sports)	5 (4 no difficulty – 0 unable to do - not applicable)	Leg, ankle, and foot musculoskeletal disorders	No	69
2005	Roorda et al[54]	Walking Questionnaire	41	n=981 Sex=54% women Age, mean±SD= 58.6± 15.4	Disability (activity limitations in walking)	2 (yes-no)	Lower-extremity disorders	No	100
2006	Van de Pol et al[55]	Pregnancy Mobility Index (PMI)	24	n=673 Sex=100% women Age=NR	Disability (mobility in relation to back and/or	4 (0 no problems performing this task - 3	Pregnant population	No	75

					pelvic pain)	performing this task is impossible or only possible with the aid of others)			
2007	Allen[56]	Movement Ability Measure (MAM)	24	n=318 Sex=65% women Age, mean (range)= 55 (18-101)	Functioning (current and preferred movement ability)	6 (1-6)	Generic	No	100
2007	Farin et al[57]	MOSES questionnaire	58	n=1019 Sex=55% women Age, mean= 68.1	Functioning (mobility, self-care and domestic life)	5 (severy limited – no limited)	Generic	Yes (ICF)	65,5
2008	Caty et al[58]	ABILOCO questionnaire	13	n=100 Sex= 40% women Age, mean±SD= 64.0±15.0	Functioning (locomotion ability)	3 (impossible-possible-not applicable)	Stroke	Yes (ICF)	100
2008	Pieterse et al[59]	Perceived Limitations and Needs Questionnaire (PLAN-Q)	25	n=208 Sex=49% women Age, mean±SD= 47.6±14.5	Disability (capacity to perform an activity and need for help)	Capacity: 5 (no effort - maximal effort - not applicable). Needs: 2 (yes-no)	Neuromuscular diseases	Yes (ICF)	64
2010	Rejeski et al[60]	Mobility Assessment Tool-MAT-sf	10	n=234 Sex=71% women Age, mean±SD= 81.9±5.3	Functioning (mobility)	items 1,2: 13 (none-60 minutes), items 3,4: 5 (none-4), items 5-10: 2 (no-yes)	Older adults	No	100
2011	Medina-Mirapeix et al[61]	Mobility Activities Measure (Mobam)	22	n=615 Sex=25,2% women Age, mean±SD= 38.1±11.4	Disability (mobility activities)	5 (1 able to do without any difficulty – 5 unable to do)	Generic	Yes (ICF)	100
2011	Stuge et al[62]	Pelvic Girdle Questionnaire (PGQ)	25	Simple 1: n=94 Sex=100% women Age, mean±SD= 34.0±5.6 Sample 2: n=87 Sex=100%	Disability (activity limitations and symptoms)	4 (0 Not at all- 3 To a large extent)	Pelvic girdle pain during pregnancy and postpartum	Yes (ICF)	64

				women Age, mean±SD= 35.0±5.0					
2012	Alghwiri et al[63]	Vestibular Activities and Participation (VAP) questionnaire	34	n=58 Sex=67% women Age, mean±SD= 52.60±16.20	Disability (activity limitations and participation restrictions)	6 (0 none – 4 unable to do - not applicable)	Vestibular disorders	Yes (ICF)	50
2013	Binda et al[64]	Chemotherapy-induced peripheral neuropathy rasch-built Overall Disability Scale (CIPN-R-ODS)	28	n=281 Sex=48% women Age, mean (range)= 63.9 (29-85).	Functioning (activity limitations and participation restrictions)	4 (0 impossible to perform-2 possible, without any difficult - not applicable)	Chemotherapy-induced peripheral neuropathy	Yes (ICF)	57,1
2013	Hart et al[65]	Lumbar Stiffness Disability Index (LSDI).	10	n=32 Sex= 69% women Age, mean±SD= 63.0±9.8	Disability (impact of spinal stiffness on functional ability)	5 (0 no effect at all – 4 cannot do at all)	Lumbar spine arthrodesis	No	50
2014	Terwee et al[66]	Animated Activity Questionnaire (AAQ)	7‡	n=33 Sex=73% women Age, mean±SD= 62.0±11.0	Disability (physical functioning)	2 to 5 levels of difficulty	Hip or knee osteoarthritis	Yes (ICF)	100
2014	Medina-Mirapeix et al[67]	Mobility Activities Measure for Inpatient Rehabilitation Settings (Mobam-in)	30	n=239 Sex=NR Age, mean±SD= 76.9±11.3	Functioning (mobility activities)	5 (4 none – 0 unable to do it)	Generic (Inpatients)	Yes (ICF)	100

TABLE 2. Classification of the instruments described in the studies included in the systematic review.

*NR: data not reported in the article. †VAS: visual analogue scale. ‡23 videos.

Component Domain		Number of questionnaires (%) N=34
Activities and Participation		
	Self-care	20 (58.8)
	Domestic life	16 (47.1)
	Community, social and civic life	8 (23.5)
	Major life areas	8 (23.5)
	Interpersonal interactions and relationships	6 (17.6)
	General tasks and demands	3 (8.8)
	Learning and applying knowledge	1 (2.9)
	Communication	1 (2.9)
Body Functions		
	Mental functions	7 (20.6)
	Sensory functions and pain	4 (11.8)
	Neuromusculoskeletal and movement-related functions	3 (8.8)
	Functions of the cardiovascular, hematological, immunological and respiratory systems	1 (2.9)
Environmental Factors		
	Products and technology	2 (5.9)
	Services, systems and policies	1 (2.9)
Nd (not definable)		4 (11.8)

TABLE 3. ICF domains assessed by questionnaires, besides mobility.

ICF categories	**Number of linked items (%)** (N=614)
d 410. Changing basic body position	119 (19.4)
d 450. Walking	91 (14.8)
d 455. Moving around	83 (13.5)
d 430. Lifting and carrying objects	71 (11.6)
d 445. Hand and arm use	64 (10.4)
d 415. Maintaining a body position	35 (5.7)
d 460. Moving around in different locations	27 (4.4)
d 465. Moving around using equipment	25 (4.1)
d 440. Fine hand use	19 (3.1)
d 420. Transferring oneself	17 (2.8)
b 710. Mobility of joint functions	8 (1.3)
d 469. Walking and moving, other specified and unspecified	8 (1.3)
d 470. Using transportation	6 (1.0)
d 475. Driving	6 (1.0)
d 435. Moving objects with lower extremities	5 (0.8)
d 489. Moving around using transportation, other specified and unspecified	2 (0.3)
d 429. Changing and mantaining body position, other specified and unspecified	1 (0.2)
nd./nc. Not definable/not covered by ICF, but related to mobility	27 (4.4)

TABLE 4. Results of linking mobility-related items to the ICF. Categories with no associated items have been excluded.

Instrument	IRT requirements	Internal consistency	Reliability	Measurement error	Content validity	Structural validity	Hypotheses testing	Criterion validity	Responsiveness
LCI*[44]	-	poor	-	-	poor	poor	-	-	-
Climbing Stairs Questionnaire[51]	good	-	poor	-	excellent	-	-	-	-
OPTIMAL[52]	-	good	-	-	excellent	good	fair	-	fair
Walking Questionnaire[54]	good	-	poor	-	excellent	-	-	-	-
MAM[56]	excellent	fair	fair	-	excellent	-	fair	-	-
ABILOCO questionnaire[58]	good	-	-	poor	excellent	-	fair	-	-
MAT-sf†[60]	fair	-	fair	-	poor	-	fair	-	-
Mobam‡[61]	excellent	fair	-	-	excellent	poor	-	-	-
AAQ§[66]	-	-	-	-	-	-	fair	-	-
Mobam-in[67]	excellent	fair	fair	-	excellent	poor	fair	-	-

TABLE 5. Methodological quality, in accordance with the COSMIN checklist with a 4-point scale[31], of studies on instruments exclusively related to mobility assessment (cross-cultural validity was excluded since none of the studies analyzed this property).

*LCI: Locomotor Capabilities Index, †MAT-sf: Mobility Assessment Tool Short Form, ‡Mobam: Mobility Activities Measure, §AAQ: Animated Activity Questionnaire.