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Multidimensional measures validated for home health needs of older persons: A systematic review

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ABSTRACT

Objective: To conduct a systematic review of the literature on valid and reliable multidimensional instruments to assess home health needs of older persons.
Design: Systematic review.
Data source: Electronic databases, PubMed/Medline, Web of Science, Scopus, Cumulative Index to Nursing and Allied Health Literature, Scientific Electronic Library Online and the Latin American and Caribbean Health Sciences Information.
Review methods: All English, Portuguese and Spanish literature which included studies of reliability and validity of instruments that assessed at least two dimensions: physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment and if such instruments proposed interventions after evaluation and/or monitoring changes over a period of time.
Participants: Older persons aged 60 years or older.
Results: Of the 2397 studies identified, 32 were considered eligible. Two-thirds of the instruments proposed the physical, psychological, social support and functional independence dimensions. Inter-observer and intra-observer reliability and internal consistency values were 0.7 or above. More than two-thirds of the studies included validity (n = 26) and more than one validity was tested in 15% (n = 4) of these. Only 7% (n = 2) proposed interventions after evaluation and/or monitoring changes over a period of time.
Conclusion: Although the multidimensional assessment was performed, and the reliability values of the reviewed studies were satisfactory, different validity tests were not present in several studies. A gap at the instrument conception was observed related to interventions after evaluation and/or monitoring changes over a period of time. Further studies with this purpose are necessary for home health needs of the older persons.

What is already known about the topic?

- The older persons' needs vary and are multifactorial and a comprehensive geriatric assessment is a multidimensional manner evaluation in which multiple problems of older people are considered.
- No consensus is found in the literature on assessment of older persons who need health care services on a domiciliary/home basis (home care, for example), especially homebound older persons.

What this paper adds

- This systematic review identified nineteen multidimensional instruments for home health needs of older persons.
- According to the multidimensional approach of this systematic review, most of the instruments propose to evaluate four or five dimensions (physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment)
- The performance of the instruments with regard to validity and reliability was considered good but different types of validity measures in the same study were only tested in six of the nineteen evaluated instruments.
- Only two instruments were developed with the purpose of implementing interventions after evaluation and/or monitoring over a period of time.

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1. Background

With the growth and ageing of the older population, a higher risk of developing co-morbities of chronic illness and disabilities is observed which, in turn, increases the demand on health services with subsequent economic and human costs (Kronish et al., 2006). Furthermore, as a consequence of ageing, an increase in the need for domiciliary care assistance occurs (Ornstein et al., 2015a).

Due to older persons' multifactorial needs, a comprehensive geriatric assessment is defined as an evaluation in which multiple dimensions are considered, such as physical, psychological, functional and relational and a coordinated care plan is developed to focus on the identified problems (Stuck et al., 1993; Cress, 2015).

The frailty approach considers older persons as more vulnerable to environmentally stressful situations and can be associated with falls, delirium (acute confusion) and immobility (Turner and Clegg, 2014). A large number of instruments exist which evaluate frailty and risk factors for adverse health outcomes but frailty assessment for the purpose of clinical decision-making and as an interventional target was found to be scarce (Buta et al., 2016). The literature highlights that reproducibility tests of frailty instruments as an evaluative outcome are unclear (de Vries et al., 2011). Although there is an understanding about home health care to support the elderly to continue living in their own homes, no consensus is found in the literature on best practices for assessment and the management of older persons who need health care services on a domiciliary/home basis (home care, for example), especially older persons who are homebound (Ornstein et al., 2015a).

Homebound persons are those who never leave the home, have difficulty in doing so or only leave their home with assistance. In this sense, homebound older persons have caught the attention of health professionals as, although they are not institutionalized, they are confined to their homes due to physical, psychiatric, and social limitations (Ornstein et al., 2015b; Cohen-Mansfield et al., 2010; Qiu et al., 2010). In this way, it is of the utmost importance to conduct early interventions with an appropriate health multidimensional approach and plan follow-ups to prevent many adverse consequences and reduce the progression to dependency (Ornstein et al., 2015a).

A multidimensional geriatric home assessment needs to include a clinical examination and a regular follow-up is as an important determinant of effects on functional status outcomes (Huss et al., 2008). Methods for measuring health problems play an important role in the diagnosis and monitoring of the effectiveness of health care (McDowell, 2006). Moreover, the healthcare measure needs to establish the nature of what is being measured, the relationship of that variable to its purported cause and the way to reflect the amount of error inherent in measurement. Thus, the knowledge of validity and reliability aids the researcher in designing, judging and choosing the relevant literature (Streiner and Norman, 2003).

Considering the importance of a multidimensional approach to health, appropriate interventions after evaluation and/or monitoring changes to home health needs of older persons, including homebound persons, over a period of time, are relevant. This study aimed to identify and synthesize the accumulated scientific literature on multidimensional instruments recommended for the older person in these contexts. It sought to answer the following research questions: What are the available instruments that focus on different dimensions simultaneously? Are such instruments valid and reliable? Do such instruments propose interventions after evaluation and/or monitoring changes over a period of time?

2. Methods

This review was registered in the International Prospective Register of Systematic Reviews under the number Crd42015017166. The website was verified to identify ongoing reviews about home health needs of older persons, including homebound persons.

2.1. Eligibility criteria

This review required publications focused on: Design and Population − studies of reliability and validity that reported the development of multidimensional instruments which assessed home health needs of older persons. No intervention or controls were applicable. Outcome − the best evidence in terms of validity and reliability of multidimensional instruments for older people who need home health services.

Studies were excluded when they took into consideration instruments which assessed only one of the proposed dimensions, the validated studies which did not include minimal samples of older persons in a home care context and when the instrument proposed to identify and assess a specific disease. Grey literature, such as theses and dissertations, reports, documents and bulletins were not included.

2.2. Search strategy for the systematic review

A bibliographic search with no time limit was performed on the databases PubMed/Medline, Web of Science, Scopus, Cumulative Index to Nursing and Allied Health Literature, Scientific Electronic Library Online and the Latin American and Caribbean Health Sciences Information. In the Scientific Electronic Library Online and Latin American and Caribbean Health Sciences Information databases, the search query used in English was also tested in Portuguese and Spanish (Table 1).

The titles and abstracts were screened by two authors (DRF and AMFW), in order to discard clearly irrelevant articles. Doubts regarding eligibility were solved following consensus among authors (DRF and ALSFM). All references cited in the selected studies were evaluated. In addition to electronic database searches, an initial search was also conducted to identify systematic reviews published by Cochrane Library, through the Database of Systematic Reviews (CDSR) and unpublished/ongoing systematic reviews were searched on the PROSPERO database. For this, the following Mesh terms were used: aged and homebound person or home care service and reproducibility of results and no systematic reviews were found. In addition, personal contacts with leading scholars on the topic of interest were conducted as a means of locating if not all, at least a representative set of papers addressing the review's research question. Thus, the authors of the selected studies were contacted by e-mail and asked to provide their unpublished studies on the development of instruments.

The search on the databases took place on 30 March 2015 and identified 2244 studies. An update was performed in June 04, 2017 and identified 2397. The software application EndNote Web 3.1, provided by the database Web of Knowledge, was used to store the identified studies and to screen duplicate ones.

2.3. Criteria for evaluation of studies and methodological quality assessment

A checklist was designed to describe and evaluate the studies. The checklist consisted of three parts. The first part contained a simple bibliometric description of the reviewed studies: first author's last name, regardless of the original authors of the instrument or independent research groups; publication language; year of publication; country of the first author's professional activities; instrument acronym.

The second part included three items on methodological quality assessment based on the pertinent literature (Streiner and Norman, 2003; Mokkink et al., 2010; Figueiredo et al., 2016). These were as follows: 1) strategies for the development of the instrument (theoretical frameworks, use or modification of existing instruments, among others) through dichotomous questions (yes/no); 2) Reliability tests (internal consistency, inter and intra-observer reliability); and 3) validity (face validity and/or content validity and/or predictive validity and/or construct). Coefficients of reliability tests and types of validity measures

Table 1
Bibliographic sources included in the review, their official languages, use of controlled vocabulary and number of studies retrieved.

Database	Database language	Search query	Use of controlled Vocabulary Terms*?	n**
PubMed	English	((((((((((("Aged"[Mesh] OR Aged [TW]) AND "Geriatric Assessment/methods"[Mesh] OR Geriatric Assessment/methods [TW]) AND "Homebound Persons"[Mesh] OR Homebound Persons [TW]) OR "Health Services for the Aged"[Mesh] OR Health Services for the Aged [TW]) OR "Long-Term Care"[Mesh] OR Long-Term Care [TW]) OR "Home Health Nursing"[Mesh] OR Home Health Nursing [TW]) OR "Home Care Services"[Mesh] OR Home Care Services [TW]) OR "Interdisciplinary Communication"[Mesh] OR Interdisciplinary Communication [TW]) OR "Benchmarking"[Mesh] OR Benchmarking [TW]) OR "Models, Organizational"[Mesh] OR Models, Organizational [TI]) AND "Reproducibility of Results"[Mesh] OR Reproducibility of Results [TI])	Yes	1749
Scopus	English	INDEXTERMS (Aged) AND INDEXTERMS (Geriatric Assessment) AND INDEXTERMS (Health Services for the Aged) OR INDEXTERMS (Long-Term Care) OR INDEXTERMS (Homebound Persons) OR INDEXTERMS (Home Health Nursing) OR INDEXTERMS (Home Care Services) AND INDEXTERMS (Reproducibility of Results)	Yes	209
Web of Science	English	(Aged) AND (Geriatric Assessment OR Health Services for the Aged OR Long-Term Care OR Homebound Persons OR Home Health Nursing OR Home Care Services) AND (Reproducibility of Results)	No	93
Cumulative Index to Nursing and Allied Health Literature	English	(Aged) AND ("Geriatric Assessment" OR "Health Services for the Aged" OR "Long-Term Care" OR "Homebound Persons" OR "Home Health Nursing" OR "Home Care Services") AND ("Reproducibility of Results")	No	273
Latin American and Caribbean Health Sciences Information	English, Portuguese and Spanish***	(Aged) AND (Health Services for the Aged OR Homebound Perso$ OR Home Health Nursing OR Home Care Servic$) AND (Reproducibility of Results)	No	48
Scientific Electronic Library Online	English, Portuguese and Spanish***	(Aged) AND ("Health Services for the Aged" OR "Geriatric Assessment" OR "Long-Term Care" OR "Homebound Persons" OR "Home Care Services" OR "Home Health Nursing")	No	25
Total				2397

*Controlled vocabulary terms assigned by the databases.*Number of studies found in the last update performed on June 04, 2017.*** The same index terms were searched in Portuguese and Spanish language.

were considered. If the study presented more than one validity measure, it was also registered.

In the third part of the checklist, a categorical question (yes/no) was also included for the dimensions considered by the instrument and the number of the dimensions evaluated according to the proposed systematic review. Finally, the categorical questions (yes/no) sought to identify the interventions after evaluation and/or monitoring changes over a period of time considered by the instrument.

2.4. Data extraction and synthesis

Data extraction was carried out by two authors (DRF and LGP). After discussion, a consensus was reached. The reviewers were not blinded to the authors of the original articles. In this systematic review, the aim was not to evaluate randomized clinical trial studies nor provide a formal *meta*-analysis. An assessment of publication bias was not conducted.

The information extracted from the original studies was synthesized according to some of the checklist items. The studies that did not fulfill each criterion received a zero rating. A positive evaluation (+) was given to each of the following criteria presented by the instrument: proposes interventions after evaluation and/or monitoring changes over a period of time; presents the methods for selection and construction of the instrument; assesses the types of validity measures of the instrument (DeVellis, 2003; Streiner and Norman, 2003), and presents reliability coefficients above 0.70 and internal consistency above 0.70 (Streiner and Norman, 2003). According to Streiner and Norman (2003), reliability may be conceptualized as the extent to which a measure produces similar measurements for individuals under different circumstances. Reliability coefficient value of 0.7 involves the minimum acceptable to the measure error variance and the variance between subjects.

In order to conduct a multidimensional assessment from an older person's perspective, a detailed investigation of the situation in terms of physical and mental state, functional status, formal and informal social support and the physical environment is considered. It requires a multidisciplinary approach to collect, interpret and synthesize information to develop an overall plan of treatment and long-term follow-up.

For this systematic review, at least two or more of the following dimensions were considered as a multidimensional approach: Physical (proposes to identify multimorbidity and complexity symptoms, chronic conditions and their functional impact on curative, restorative, palliative, or preventive treatment), psychological (evaluates the cognitive, behavioral, and emotional status, e.g. signs of dementia, delirium, and depression), social support and functional independence (assessment of the older persońs willingness, competence, acceptability, cultural, ethnic, spiritual values, ability to adequately and safely perform the basic), self-rated health behaviors (assessment of perception about own health status regarding disease impact on individual well-being) and contextual environment (physical environment in combination with an understanding of the older persońs ability) (Rubenstein and Stuck, 2006; Cress, 2015).

3. Results

3.1. Search strategy

The search identified 2397 studies. No systematic reviews about this topic were found. E-mail communication with the authors of the selected studies did not identify any unpublished studies. After screening titles and, when appropriate, abstracts, 32 studies were selected. These studies describe the development of the instruments in terms of validity and reliability. These publications received full-text reading and their reference lists were also analyzed (Fig. 1).

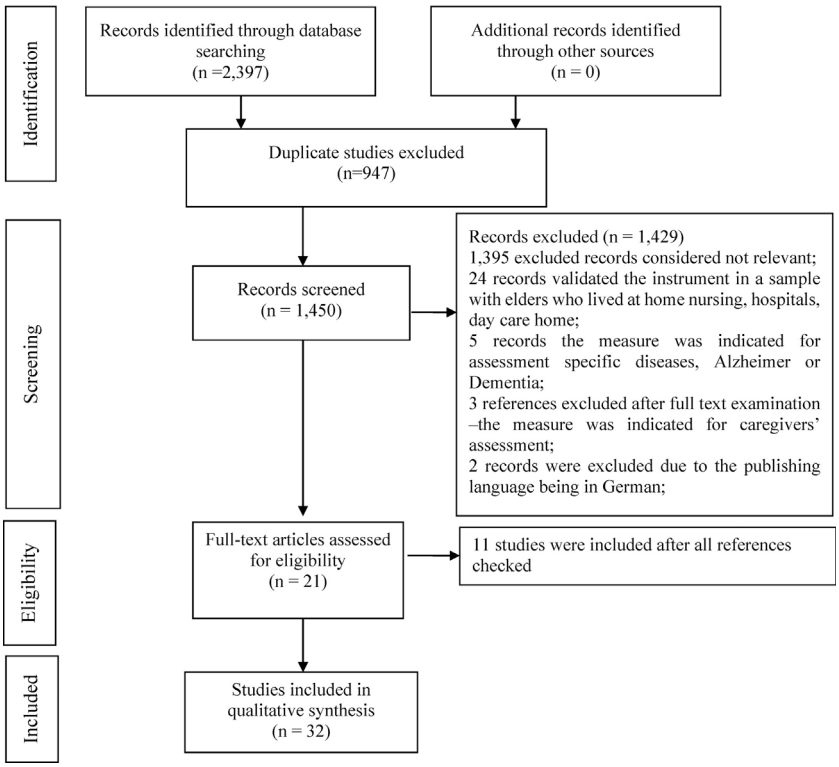

Fig. 1. Review flowchart.

3.2. Identification of the instruments

Among the 32 studies, twenty instruments tested reliability and types of validity measures, two-thirds (n = 14, 70%) proposed the physical, psychological, social support and functional independence dimensions, although self-rated health behaviors and contextual environment dimensions were found in more than 50% of them. For 7% (n = 2) of the studies (Maggs and Abedi, 1997; Rockwood et al., 2000), the authors proposed the interventions after evaluation and/or monitoring changes over a period of time (Table 2).

3.3. Measures of validity and reliability

Sixty-three percent (n = 20) of the studies were published before 2006. More than two-thirds of the studies included validity (n = 26, 81%). Among these, construct validity was evaluated in 54% of the studies (n = 14), only face or content validity in 22% (n = 5); predictive validity was tested in 12% (n = 3); criterion validity was used in 15% (n = 4) of the studies. More than one type of validity was tested in 15% (n = 4), among these, Tilburg Frailty Indicator (Gobbens et al., 2010) tested construct validity and predictive validity, Edmonton Frail Scale tested construct validity and criterion validity and Kihon Checklist did not mention the type of validity results. Groningen Frailty Indicator tested construct, content and criterion validity. The strategy for item development was reported in 94% of the 32 studies (Table 3).

In 44% (n = 14) of the studies, the internal consistency estimates were tested. In 40% of papers which reported inter-rater reliability, a value > 0.70 was found. Intra-observer reliability testing was used in one-fourth of the studies (Table 3).

4. Discussion

Most studies related to multidimensional instruments were first published by authors in the US (n = 12), followed by the UK. The majority of the studies in these countries were published before 2006, which may suggest that researches were more focused on this subject during this year or before. All the frailty instruments validated for home health needs of older persons, however were published after 2006 (Gobbens et al., 2010; Gobbens et al., 2012; Santiago et al., 2013; Fabricio-Wehbe et al., 2009; Fabricio-Wehbe et al., 2013).

In general, most instruments evaluated dimensions such as physical, psychological, social support and functional independence. Comprehensive assessments of older people have taken into account not only medical diagnoses but also functional impairments and the environmental and social issues which affect older persons' wellbeing (Rubenstein and Stuck, 2006). Most older people often have cognitive and affective problems which interfere in health care, especially homebound elders who, while not institutionalized, are confined to their homes due to physical, psychiatric and social limitations. The problems suffered by this group often involve more than one domain of the assessment (Qiu et al., 2010). Although all the instruments have concerns about home health needs of older persons, only the Frail Elderly Functional Assessment tested validity considering the context of homebound persons (Gloth III et al., 1995).

According to types of validity measures, the face validity was not evident in the studies. All the instruments emphasized a conceptual model to justify the conditions assessed and it is an important topic for content validity when considering the development of a theoretical map (DeVellis, 2003; Streiner and Norman, 2003). The construct validity was tested by eleven instruments and this validity is directly concerned with the legitimacy of the instrument's performance in relation to an existing theory. It also refers to a wide range of approaches used when one is trying to measure a hypothetical construct (DeVellis, 2003; Streiner and Norman, 2003). The prediction is used to refer to the functional relationships between instruments by collecting evidence at different times (DeVellis, 2003; Streiner and Norman, 2003). In this review, Tilburg Frailty Indicator, Instrumental Activities Daily Living and Iso-Functional Autonomy Measurement System tested predictive validity, and the latter tested in terms of nursing care time, nursing care cost and total cost (care, infrastructure, functioning and administrative support).

Intra- and inter-observer reliabilities were tested in 16 studies. The use of two reliabilities could only be observed in 7 studies. The reliability values presented in the studies were appropriate (Streiner and

Table 2
Multidimensional instruments according to their acronyms, year of the first publication, country of professional activity of the first author, the dimensions were evaluated, interventions after evaluation and/or monitoring changes over a period of time and number of associated studies.

Instrument Name or Acronym	Author and Year of the first publication*/country of the first author professional activities	Dimension considered	Interventions and monitoring changes over a period of time were proposed?**
1-Camberwell Assessment of Need for the elderly (CANE)	Walters K/2000/UK (England)	Physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment	0
2-Elderly at risk rating scale (EARRS)	Donald I/1997/UK (England)	Physical, psychological, social support and functional independence	0
3-Tilburg Frailty Indicator (TFI)	Gobbens RJ/2010/The Netherlands	Physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment	0
4-Groningen Activity Restriction Scale (GARS)	Kempen GIJM/1996/The Netherlands	Physical, psychological, social support and functional independence	0
5-Omaha Classification Scheme (OCS)	Maggs C/1997/UK (England)	Physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment	+
6-Cuestionario para la detección de ancianos con necessidades de servicios sociosanitarios	Rivero E/1993/Spain	Physical, psychological, social support and functional independence and contextual environment	0
7-Goal Attainment Scaling (GAS)	Rockwood K/2000/Canada	Physical, psychological, social support and functional independence and contextual environment	+
8-Wellness Assessment Tool (WEL)	Strout K/2014/United States of America	Physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment	0
9-Functional Independence Measure (FIM)	Yamada S/1994/United States of America	Physical, psychological, social support and functional independence	0
10-Older Americans' Resources and Services Multidimensional Functional Assessment Questionnaire (OARS-MFAQ)	Fillenbaum GG/1981/United States of America	Physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment	0
11-Edmonton Frail Scale (EFS)	Fabrício-Wehbe SCC/2009/Brazil	Physical, psychological, social support and functional independence and contextual environment	0
12-Functional Autonomy Measurement System (SMAF)	Hébert R/1988/Canada	Physical, psychological, social support and functional independence	0
13-Functional Autonomy Measurement System (Iso-SMAF)	Dubuc N/2006/Canada	Physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment	0
14-Frail Elderly Functional Assessment (FEFA)	Gloth FM 3rd/1995/United States of America	Physical, psychological, social support and functional independence	0
15-Instrumental Activities Daily Living (IADL)	Ng TP/2006/United States of America	Physical, psychological, social support and functional independence and contextual environment	0
16-Minimum Data Set for Home Care (MDS-HC)	Kwan CW/1997/United States of America	Physical, psychological, social support and functional independence, self-rated health behaviors and contextual environment	0
17-Short-form 36 Health Status Questionnaire (SF-36)	Lyons R/1994/UK (Wales)	Physical, psychological, social support and functional independence and contextual environment	0
18-Kihon Checklist (KCL)	Sewo Sampaio PY/2014/Japan	Physical, psychological, social support and functional independence and contextual environment	0
19-Performance Evaluation Tool − Modified Barthel Index (PET-MBI)	Ohura T/2014/Japan	Physical, psychological, social support and functional independence	0
20- Groningen Frailty Indicator	Olaroiu/2014/Nethertlands	Physical, psychological, social support and functional independence and contextual environment	0

*Validity studies about instrument relate to assessment and/or intervention in home health needs of older persons.
**+ = Positive assessment; 0 = null assessment.

Norman, 2003). Furthermore, 14 studies tested internal consistency and the values were above 0.7. The internal consistency of an instrument calculates the degree to which the selected items measure the phenomenon and address one of the main sources of measurement error, that is, inclusion of items that do not represent the phenomenon being investigated (Streiner and Norman, 2003).

The measurement must meet two essential requirements, that is reliability and validity, since reliable measurements are replicable and consistent and generate the same results. Valid measurements are accurate representations of the characteristic to be measured, and not every reliable measure is valid (Streiner and Norman, 2003). Although 14 studies proposed to evaluate the homogeneity of the instruments, when considering the different types of reliability and validity tested, the instruments which performed the best are Tilburg Frailty Indicator and Minimum Data Set for Home Care.

The morbidity patterns in the aged are complex and the continuous interventions and monitoring of health status from a home-basis perspective may be effective in intercepting social, psychological and medical problems according to the local health and community services. This kind of interventions and monitoring helps to reduce morbidity, improve quality of life and reduce the demand for high cost medical services (Celler et al., 1995). Additionally, in the primary

Table 3
Classification of 32 studies evaluated in this review by instrument name, mention of the method for selection and construction of the index and validity and reliability methods.

Study	Instrument name by acronym	Reported their strategy for item development?	Reported efforts towards for validation?	Intra- and/or inter-observer reliability coefficient above 0.70?	Internal consistency value above 0,70?
Developing capacities in ageing studies in the Middle East: Implementation of an Arabic version of the CANE IV among community-dwelling older adults in Lebanon (AbiHabib et al., 2011)	CANE IV	+	+(construct)	0	+
Assessing met and unmet needs in the oldest-old and psychometric properties of the German version of the Camberwell Assessment of Need for the Elderly (CANE) − a pilot study (Stein et al., 2014)	CANE	+	+(construct)	0	0
Assessing needs from patient, carer and professional perspectives: the Camberwell Assessment of need for Elderly people in primary care (Walters et al., 2000)	CANE	+	+(content)	0	0
Development of a modified Winchester disability scale-the elderly at risk rating scale (Donald, 1997)	EARRS	+	+(content)	+ (intra; inter)	0
The Tilburg Frailty Indicator: Psychometric Properties (Gobbens, 2010)	TFI	+	+(construct; predictive)	+(intra)	+**
The Predictive Validity of the Tilburg Frailty Indicator: Disability, Health Care Utilization, and Quality of Life in a Population at Risk (Gobbens et al., 2012)	TFI	+	+(predictive)	0	0
Psychometric properties of the Brazilian version of the Tilburg frailty indicator (TFI) (Santiago et al., 2013)	TFI	+	+(construct)	+(intra)	+
The assessment of disability with the Groningen Activity Restriction Scale Conceptual framework and psychometric properties (Kempen et al., 1996)	GARS	+	+(construct)	0	+
Identifying the health needs of elderly people using the Omaha Classification Scheme (Maggs and Abedi, 1997)	OCS	+	+(content)	0	+
Evaluación del diseño y de la fiabilidad de un cuestionario para la detección de ancianos con necessidades de servicios sociosanitarios (Rivero et al., 1993)	–	+	+(face/ content)	+(intra; inter)	0
A clinimetric evaluation of specialized geriatric care for rural dwelling, frail older people (Rockwood et al., 2000)	GAS	+	0	+(inter)	0
Application of the Rasch model to measure five dimensions of wellness in community-dwelling older adults (Strout and Howard, 2014)	WEL	+	+(construct)	0	+
Development of a short version of the motor FIM™ for use in long-term care settings (Yamada et al., 2006)	FIM	0	0	+(inter)	0
Inter-Rater Agreement and Stability of Functional Assessment in the Community-Based Elderly (Ottenbacher et al., 1994)	FIM	+	0	+(intra; inter)	0
Reliability and Validity of the FIM for Persons Aged 80 Years and Above From a Multilevel Continuing Care Retirement Community (Pollak et al., 1996)	FIM	+	+(construct)	+(intra)	0
The development, validity, and reliability of the OARS Multidimensional FunctionalAssessment Questionnaire (Fillenbaum and Smyer, 1981)	OMFAQ	+	0	+(intra; inter)	0
Versión española del OARS Multidimensional functional assessment questionnaire: adaptación transcultural y medida de la validez (Grau Fibla et al., 1996)	OARS-MFAQ	+	0	0	+
Cross-cultural adaptation and validity of Edmonton Frail Scale −EFS a Brazilian elderly sample (Fabrício-Wehbe et al., 2009)	EFS	+	+(construct; criterion)	+(inter)	0
Reproducibility of the Brazilian versión of the Edmonton Frail Scale for elderly living in the Community (Fabrício-Wehbe et al., 2013)	EFS	0	0	+(intra; inter)	0
The functional autonomy measurement system (SMAF) description and validation of an instrument for the measurement of handicaps (Hebert et al., 1988)	SMAF	+	+(content; criterion)	+(inter)	0
Disability-based classification system for older people in integrated long-term care services: The Iso-SMAF profiles (Dubuc et al., 2006)	Iso-SMAF	+	+(predictive)	+(inter)	0
Reliability and validity of the Frail Elderly Functional Assessment questionnaire (Gloth III et al., 1995)	FEFA	+	+(construct)	+(intra; inter)	0
Comparative validity of seven scoring systems for the instrumental activities of daily living scale in rural elders (Vittengl et al., 2006)	IADL	+	+(predictive)	0	+
Physical and Cognitive Domains of the Instrumental Activities of Daily Living: Validation in a Multiethnic Population of Asian Older Adults (Ng et al., 2006)	IADL	+	+(construct)	0	+
Comprehensive Clinical Assessment in Community Setting: Applicability of the MDS-HC (Morris et al., 1997)	MDS-HC	+	0	+(inter)	+

(*continued on next page*)

Table 3 (*continued*)

Study	Instrument name by acronym	Reported their strategy for item development?	Reported efforts towards for validation?	Intra- and/or inter-observer reliability coefficient above 0.70?	Internal consistency value above 0,70?
Minimum Data Set for Home Care A Valid Instrument to Assess Frail Older People Living in the Community (Landi et al., 2000)	MDS-HC	+	+ (criterion)	0	0
Validation of Minimum Data Set for Home Care Assessment Instrument (MDS-HC) for Hong Kong Chinese Elders (Kwan et al., 2000)	MDS-HC	+	+ (criterion)	+ (inter)	+
Evidence for the Validity of the Short-form 36 Questionnaire (SF-36) in na Elderly Population (Lyons et al., 1994)	SF-36	+	+ (construct)	0	+
Validation and translation of the Kihon Checklist (frailty index) into Brazilian Portuguese (Sewo Sampaio et al., 2014)	KCL	+	+ (content*)	0	+
Assessment of the Validity and Internal Consistency of a Performance Evaluation Tool Based on the Japanese Version of the Modified Barthel Index for Elderly People Living at Home (Ohura et al., 2014)	PET-MBI	+	+ (construct)	0	+
The psychometric qualities of the Groningen Frailty Indicator in Romanian community-dwelling old citizens (Olaroiu et al., 2014)	GFI	+	+ (construct; content; criterion)	0	+
Construct validity of the Groningen Frailty Indicator established in a large sample of home-dwelling elderly persons: Evidence of stability across age and gender (Peters et al., 2015)	GFI	+	+ (construct)	0	0

+ = Positive assessment; 0 = null assessment.
*Not mentioned what were the other validity.
**For physical domain.

healthcare, programs for the homebound, older person context can reduce hospitalizations and long-term care admissions while improving individual and caregiver quality of life and care satisfaction (Stall et al., 2014).

In this sense, The Goal Attainment Scaling instrument (Rockwood et al., 2000) proposed a follow-up assessment at 3, 6, and 12 months in geriatric care by specialists and the authors concluded that the intervention did not prolong life or delay institutionalization. Important clinical benefits were observed, however The Omaha Classification Scheme instrument did not present details about intervention/monitoring changes over a period of time. Although these two instruments suggested some kind of intervention, reliable tests and different types of validity were not tested in the studies.

In the older person's primary healthcare, several core components are shared through inter-professional care teams, regular inter-professional care meetings, after-hours support and initial in-home comprehensive geriatric assessments to help formulate a care plan (Stall et al., 2014). For this systematic review, it is not clear if the presence of reliability and validity acceptable by the instruments, which included follow-ups on a weekly or monthly basis, influences the outcomes at individual and system levels.

This systematic review presents an evaluation of reliability and validity studies on multidimensional instruments used in the assessment of the health needs in the home of the elderly. However, a lack of information was observed in the studies related to the dimensions or the nature of the monitoring or proposed interventions. In some studies, the instruments were not illustrated by dimensions. For an empirical standardization of results from this systematic review, the authors reorganized the items of the instruments according to the considered dimensions of this study. Due to the lack of a validated preliminary checklist to evaluate the methodological quality of the reviewed studies, according to the multidimensional approach and validity and reliability tests, a preliminary checklist was developed by the present authors according to the literature (Rubenstein and Stuck, 2006; Cress, 2015; DeVellis, 2003; Streiner and Norman, 2003; Figueiredo et al., 2016). For a holistic approach of these instruments in this systematic review, validity tests (especially content and construct) were considered, although this systematic review does not evaluate the problems inherent to the design of the selected studies or assessment of publication bias. Finally, a search for unpublished studies in grey literature, such as theses and dissertations, reports, documents and bulletins, was not performed.

5. Conclusion

This study sought to contribute to scientific evidence regarding types of validity measures and reliability tests carried out during the development of multidimensional instruments for home health needs of older persons. From a multidimensional assessment perspective, it was observed that most of the selected studies presented four or five dimensions for assessment of home care needs for older persons. In general, the instruments presented satisfactory reliability values and validity measures although different types of validity measures were not presented in several studies. A gap was observed, however, in the instruments related to items which assess interventions after evaluation and/or monitoring changes over a period of time. This is considered an important aspect in the comprehensive and continuous assessment for geriatric care in the home.

Authors contributions

DRF: study conception and design, acquisition of data, analysis and interpretation of data, drafting the article, final approval of the version to be submitted. Paes: study conception and design, analysis and interpretation of data. Warmling: acquisition of data, analysis and interpretation of data. Erdmann: revising it critically for important

intellectual content. Mello: study conception and design, analysis and interpretation of data, revising it critically for important intellectual content, final approval of the version to be submitted.

Conflict of interest

None for all authors.

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