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Screening for dependence in activities of daily living in the elderly: minimum set of questions

ABSTRACT

OBJECTIVE: To analyze non-redundant questions on independence in activities of daily living in the elderly, representing the spectrum of dependency.

METHODS: Multicenter project with a probabilistic population sample of 5,371 elderly residents in Sao Paulo, SP, Rio de Janeiro, RJ, Fortaleza, CE and Bambui, MG in 2008. A household survey was carried out and a questionnaire with 20 activities of daily living applied for the elderly to self-assess the difficulty/need for help in performing them. The responses were analyzed according to: the prevalence of some kind of difficulty/need for help for each activities of daily living, the frequency of non-response, and the grouping of activities in factor analysis.

RESULTS: The personal activities (e.g., dressing) have, on average, a low prevalence of difficulty or need for help, compared to instrumental activities (e.g., shopping), and have lower rates of non- response. In factor analysis it was possible to identify three factors grouping the activities of daily living: one relative to mobility (e.g., walking 100 m), another for personal needs (e.g., bathing) and one relative to what someone else can do for the elderly (e.g., washing clothes). The activities of daily living with the highest eigenvalues in each group were also analyzed in the light of the prevalence of reported need for help and the proportion of non response. Three activities of daily living were selected as representing the spectrum of dependency and being well understood by the elderly – getting out of bed, bathing and walking 100 m.

CONCLUSIONS: With only three activities of daily living we can have a simple and reliable screening instrument capable of identifying elderly in need of help in daily life. Estimating demand for care on a daily basis is an important indicator for planning and administration of health services within the paradigm of chronic diseases and population aging.

DESCRIPTORS: Aged. Personal Autonomy. Activities of Daily Living. Questionnaires. Diagnostic Techniques and Procedures. Multicenter Studies as Topic.

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INTRODUCTION

Growing old, even without chronic diseases, involves some loss in function, shown in decreasing vigor, strength, alertness, rate of systemic reaction and metabolic efficiency. Fewer than 10% of people aged 65 and over are free of any chronic health problem and over 10% report having at least five concurrent chronic diseases.[12] This high prevalence of chronic disease exacerbates the loss of functional capacity in subjects who are growing old. Longitudinal studies show that loss of functional capacity is an important risk factor for mortality.[3,11]

Independence and autonomy involve social and economic aspects and, most noticeably, the physical and mental abilities necessary to carry out activities of daily living (ADL) adequately and without the need for help.[16] In Brazil, 7% of the population aged 60 and over have difficulties or are not able to carry out ADL unaided.[4] It is estimated that there are at least 1.3 million elderly individuals in the country with some degree of dependence in carrying out these activities. The independence referred to in the ADL is used as a marker of functional capacity in the elderly.[1,4,10]

Individuals of advanced age have less independence and autonomy in their daily life compared to younger adults. A high proportion of the elderly will have some degree of difficulty and the need for formal or informal help in their daily life in the final third of their life. There is a socio-economic gradient in the functional capacity of elderly adults. In England, for example, the prevalence of two or more limitations to mobility and or in ADL increases by 17% among those on a higher income and by 31% among those on a lower income.[5] This gradient also exists in Brazil and the rates of prevalence are even higher for the same income levels (28% and 43% respectively).[5] In countries with lower socio-economic levels, growing demand for formal and informal services, as well as the risk of social isolation among the most needy, can be foreseen.

How can the elderly individual's need for day to day care be reliably estimated? In Brazil, various questionnaires exist and are in use which propose a multi-dimensional evaluation of functional capacity, including measuring independence in the elderly individual's ADL.[2,7,8,13,17,a] Despite the widespread use of these questions on ADL, there is no one format. The instruments all address carrying out ADL, collect the elderly individuals' subjective responses which try to quantify the degree of difficulty in performing certain tasks and whether there is need for help from others in perform them. The ADL included in these instruments are grouped into two categories: the first is characterized by actions aimed at self-care and basic survival, so-called basic activities of daily living (BADL); the second contains more complex activities which encourage the elderly individual's interaction with the environment and society, and are called instrumental activities of daily living (IADL). There is a hierarchy among them, which means that IADL are compromised before BADL, due to their greater complexity.[9]

The elderly's responses to BADL, although subjective, do not show a large degree of cultural, social or gender bias – at least in Western urban populations, in which the actions of washing, dressing and preparing food do not vary greatly. The same cannot be said of the IADL, which tend to suffer strong social cultural and gender bias.[14]

Another difficulty concerns the significance of the evaluation scales. The instruments used produce a score which indicates the number of activities in which the elderly individual reports difficulty and/or need for help. The scale varies from zero (no activity affected) to the total number of affected activities investigated. So, what in fact represents day to day dependency in the elderly? Three, six or all activities being affected? Each instrument has a differing number of ADL, generating scores which are difficult to compare. Moreover, many activities are co-related, i.e., if an individual is incapable of performing one, will be incapable of performing the other.

This study aimed to analyze the non-redundant questions on independence in activities of daily living in elderly people which represent the spectrum of dependency.

METHODS

Multi-centric population based study, with a cross-sectional design, of 5,359 elderly individuals (60 and over) in four Brazilian cities: Sao Paulo, SP, Rio de Janeiro, RJ, Bambuí, MG, and Fortaleza, CE, in 2008. Elderly individuals in different situations were assessed, including large urban centers of the Southeast and Northeast regions and a small municipality in the interior of Minas Gerais.

The study areas were outlined using maps from the Brazilian Institute of Geography and Statistics (IBGE) and the census tracts selected, in which elderly individuals living in the community were traced. The sampling was random, in stages, and the selected tracts were surveyed by trained personnel in order to list elderly individuals resident in the area. The goal

[a] Duke University, Older American Resources and Services Program. Multidimensional functional assessment: the OARS methodology: a manual. Durham: Duke University Center for the Study of Aging and Human Development; 1978.

was to reach 6,000 subjects, 1,500 in each center. In Sao Paulo, the elderly individuals selected lived in the district of Vila Mariana, in the Vila Clementino neighborhood which has low levels of migration and good socioeconomic conditions. In Rio de Janeiro, the sampling took place in Tijuca, Andaraí and Vila Isabel, traditional neighborhoods with a lot of retired civil servants and a medium socioeconomic level.[18] Tracts classified as below normal by the IBGE were excluded as they represented locations known to be violent and difficult to reach. In Fortaleza, the elderly individuals selected were residents of the Rodolfo Teófilo neighborhood, a lower middle class neighborhood in the Southeast of the city. In Bambuí, residents in the urban area of the municipality aged 65 and over were recruited and simple random sampling of 50% of the residents aged 60 to 64.

The interviewees were drawn using a computer program, based on the lists of the areas surveyed. The interviews took place in the residences, with the interviewers going from door to door, and were conducted with and without the presence of family members or carers. After two arranged visits without managing to interview the elderly, they were excluded and the interviewer moved on to the next selected residence.

The instrument used in the research was the result of comparing all of the ADL in different questionnaires in use in Brazil: 15 questions from the Brazilian version of OARS Multidimensional Functional Assessment Questionnaire (BOMFAQ),[8] 15 from the Brazil Old Age Schedule (BOAS),[18] 13 from the Functional Independence Measure (MIF)[13] and 22 from the System for Measuring Functional Autonomy (SMAF),[2] eliminating repetitions and combining similar activities. The phrasing of the questions drawn from the original instruments was discussed and a new phrasing, common to all of the activities, was created, irrespective of the instrument from which they came. An instrument containing 20 questions on ADL was created, with the statements read to the respondent.

The 20 questions were analyzed one by one, as the objective was not to evaluate the ADL as a scale but as indicators of functional loss and dependency. Each activity was analyzed according to the degree of difficulty reported in achieving it (no difficulty; some difficulty) and the reported need for help (no need for help; in need of some help).

The elderly individuals' responses to the ADL were analyzed according to four criteria: prevalence of any difficulty (yes, a little; yes, a lot; unable to complete the task); prevalence of need for help in carrying out each of the activities (referred to as dependent on assistance); frequency of non-response to these questions; and grouping of the activities using factor analysis.

The tetrachoric correlation matrix[15] between the dichotomized variables was calculated and assessed by exploratory factor analysis using the principal component method to extract the factors and "Varimax" rotation.[6] A common approach for determining the number of factors is to take the number of eigenvalues of the correlation matrix with magnitude > 1.[6] A reduction in the number of questions addressed can be obtained if only those questions with a factorial load > 0.5 are considered in the rotated factors, removing questions with a similar factorial load in more than one factor. The analyses were carried out using the SAS version 8 statistical program.

The study was approved by the Research Ethics Committees of the universities involved (UNIFESP 0574/09; *Instituto de Pesquisa René Rachou* 13/08; *Universidade Federal do Ceará* 155/08). The participants signed a consent form.

RESULTS

There were 5,359 elderly individuals interviewed (1,435 in Fortaleza, CE; 1,378 in Bambuí, MG; 1,060 in Rio de Janeiro, RJ; and 1,498 in São Paulo, SP).

The elderly reported having more difficulties carrying out the following activities: cutting toenails (54.4%), managing their bank account (49.8%), going up and down stairs (46.1%) and washing clothes (44.4%). The activities cited least often were: combing their hair (6.9%), walking around the home (11.9%) and bathing (12.2%) (Table 1).

They reported needing the most help to accomplish the following activities: cutting toenails (46.1%), managing their bank account (42%), washing clothes (34.9%) and doing the shopping (34.8%). The activities for which they needed help least frequently were combing their hair (4.5%), eating a meal (5.7%) and walking around the home (5.5%). The mean frequency with which help was needed to accomplish activities was 10%, but the mode was below this (4%) (Table 2).

The majority managed their personal needs without difficulty (over 87% of the elderly individuals managed to do their hair, feed themselves, walk around the home and bather themselves with no difficulty). The instrumental activities, such as managing a bank account or washing clothes are among those which present the greatest difficulty (around 50% reported some degree of difficulty). The personal activity of cutting toenails proved to be the most difficult (only 45% reported accomplishing this without difficulty).

Doing their hair, eating a meal, walking around the home, getting into bed, bathing, sitting down and getting dressed are activities which around 90% of the elderly individuals accomplished unaided. Managing

Table 1. Distribution of the elderly individuals according to perceived difficulty in the twenty activities of daily living studied. Sao Paulo, SP, Fortaleza, CE, Bambuí, MG, and Rio de Janeiro, RJ, Brazil, 2008. (N = 5,359)

Difficulty	None		A little		A lot		Unable to		Unanswered	
	n	%	n	%	n	%	n	%	n	%
Grocery shopping	3,278	61.2	586	10.9	417	7.8	1,032	19.3	46	0.9
Using transport	3,323	62.0	733	13.7	800	14.9	459	8.6	44	0.8
Managing a bank account	2,547	47.5	406	7.6	602	11.2	1,661	31.0	143	2.7
Dealing with money	4,564	85.2	181	3.4	114	2.1	456	8.5	44	0.8
Bowel and bladder control	4,300	80.2	654	12.2	318	5.9	48	0.9	39	0.7
Going up and down stairs	2,847	53.1	1,402	26.2	727	13.6	340	6.3	43	0.8
Walking 1 km	3,218	60.0	792	14.8	443	8.3	853	15.9	53	1.0
Walking 100 m	4,006	74.8	552	10.3	381	7.1	365	6.8	55	1.0
Walking around the home	4,678	87.3	313	5.8	213	4.0	108	2.0	47	0.9
Preparing a meal	3,432	64.0	237	4.4	109	2.0	1,408	26.3	173	3.2
Washing clothes	2,801	52.3	402	7.5	218	4.1	1,757	32.8	181	3.4
Dressing	4,276	79.8	618	11.5	315	5.9	113	2.1	37	0.7
Bathing	4,665	87.0	285	5.3	256	4.8	112	2.1	41	0.8
Eating	4,871	90.9	214	4.0	172	3.2	62	1.2	40	0.7
Using the telephone	3,917	73.1	556	10.4	347	6.5	472	8.8	67	1.3
Managing prostheses	3,904	72.9	53	1.0	49	0.9	276	5.1	1,077	20.1
Cutting toenails	2,406	44.9	697	13.0	644	12.0	1,570	29.3	42	0.8
Combing hair	4,947	92.3	140	2.6	106	2.0	125	2.3	41	0.8
Sitting down/standing up	4,049	75.6	879	16.4	305	5.7	83	1.6	43	0.8
Getting into and out of bed	4,212	78.6	746	13.9	276	5.1	84	1.6	41	0.8

Table 2. Distribution of elderly individuals according to perceived need for help in the twenty activities of daily life studied. Sao Paulo, SP, Fortaleza, CE, Bambuí, MG, and Rio de Janeiro, RJ, Brazil, 2008. (N = 5,359)

Need for help	None		A little		A lot		Unanswered	
	n	%	n	%	n	%	n	%
Grocery shopping	3,242	60.5	690	12.9	1,174	21.9	253	4.7
Using transport	3,711	69.2	369	6.9	1,079	20.1	200	3.7
Managing a bank account	2,541	47.4	446	8.3	1,805	33.7	567	10.6
Dealing with money	4,660	87.0	127	2.4	392	7.3	180	3.4
Bowel and bladder control	4,995	93.2	79	1.5	247	4.6	38	0.71
Going up and down stairs	4,190	78.2	364	6.8	558	10.4	247	4.6
Walking 1 km	3,945	73.6	216	4.0	416	7.8	782	14.6
Walking 100 m	4,417	82.4	182	3.4	413	7.7	347	6.5
Walking around the home	4,964	92.6	117	2.2	179	3.3	99	1.8
Preparing a meal	3,254	60.7	635	11.8	944	17.6	526	9.8
Washing clothes	2,845	53.1	634	11.8	1,239	23.1	641	12.0
Dressing	4,770	89.0	223	4.2	351	6.5	15	0.3
Bathing	4,919	91.8	94	1.7	331	6.2	15	0.3
Eating	5,038	94.0	103	1.9	204	3.8	14	0.3
Using the telephone	4,244	79.2	235	4.4	619	11.6	261	4.9
Managing prostheses	3,974	74.2	26	0.5	75	1.4	1,284	24.0
Cutting toenails	2,718	50.7	640	11.9	1,835	34.2	166	3.1
Combing hair	5,087	94.9	65	1.2	177	3.3	30	0.6
Sitting down/standing up	4,891	91.3	195	3.6	237	4.4	36	0.7
Getting into and out of bed	4,929	92.0	159	3.0	242	4.5	29	0.5

their bank account, washing clothes and preparing a meal are activities with which around 40% of the elderly reported needing some help.

The alternatives "don't know, non-response or does not apply" were considered to be non-responses. The questions which had the highest percentage of non-response regarding the need for help were handling prostheses (24%); walking 1 km (over 15%); washing clothes (12%); banking transactions (11%) and preparing meals (10%). Personal activities such as getting into bed, bathing and dressing had the lowest non-response rates (< 1%) (Table 2).

Analysis of the groupings allowed the different subjacent constructs to the elderly individuals' perception of difficulties and need for help in accomplishing day to day activities to be identified. Factor analysis of data on self-assessed difficulties in daily activities showed nonspecific factors with relatively low eigenvalues and no clear differentiation among the factors that would allow more conclusive analysis (Table 3).

Three factors were identified in the analysis of the responses about the need for help, but with higher eigenvalues for some activities in each of them and greater differentiation between the three factors. In the first factor, getting into and out of bed had the most significant eigenvalue (0.91394); in the second factor, walking 1 km had the highest eigenvalue (0.88574); and in the third factor, preparing a meal had the highest eigenvalue (0.78574) (Table 4).

Analysis of the significance of this grouping of activities made it possible to identify three constructs related to the need for help: a) personal necessities (getting into and out of bed; combing hair; bathing; sitting down and standing up; dressing; bladder and bowel control; eating; walking around the home; managing prostheses; cutting toenails); b) medium and long distance mobility (walking 1km; walking 100m; using transport; going up and down stairs) and c) activities which another person can do for them (preparing a meal; washing clothes; grocery shopping; managing the bank account; dealing with money; using the telephone).

DISCUSSION

The results confirm those of other population surveys with the elderly in that the majority of the elderly individuals are independent and do not require help in their

Table 3. Factors retained by the criterion of eigenvalues > 1 for responses about "difficulty in daily activity" of the elderly individuals in Sao Paulo, SP, Fortaleza, CE, Bambuí, MG and Rio de Janeiro, RJ, Brazil 2008. (N = 5,359)

Difficulty	Factor 1	Factor 2	Factor 3
Sitting down/standing up	**0.7945**	0.2367	0.3505
Getting into and out of bed	**0.74625**	0.2753	0.3978
Going up and down stairs	**0.7203**	0.4929	0.1558
Walking 1 km	**0.6535**	0.6214	0.1657
Dressing	**0.6294**	0.3253	0.5234
Walking around at home	**0.6145**	0.5674	0.4609
Cutting the toenails	**0.6060**	0.3512	0.2724
Bowel and bladder control	**0.4591**	0.2566	0.4081
Grocery shopping	0.3990	**0.7594**	0.3233
Using transport	0.4625	**0.7292**	0.2777
Dealing with money	0.2851	**0.7083**	0.5039
Managing a bank account	0.2463	**0.7015**	0.2172
Walking 100 m	0.6052	**0.6927**	0.2592
Using the telephone	0.2618	**0.4953**	0.4258
Combing hair	0.5272	0.3414	**0.6915**
Preparing a meal	0.0863	0.4400	**0.6881**
Eating	0.4620	0.3750	**0.6711**
Bathing	0.5658	0.4525	**0.6522**
Washing clothes	0.1869	0.4160	**0.5839**
Managing prostheses	0.2360	0.0214	**0.5257**

Table 4. Factors retained by the criterion of eigenvalues> 1 in responses to "need help in daily activity" for the elderly individuals in Sao Paulo, SP, Fortaleza, CE, Bambuí, MG, and Rio de Janeiro, RJ, Brazil, 2008. (N = 5,359)

Dependence on help	Factor 1	Factor 2	Factor 3
Getting into and out of bed	**0.9144**	0.2034	0.3096
Combing hair	**0.8937**	0.1751	0.3305
Bathing	**0.8928**	0.3251	0.2882
Sitting down/standing up	**0.8921**	0.2208	0.3196
Dressing	**0.8880**	0.2941	0.2925
Bowel and bladder control	**0.8729**	0.2754	0.2009
Eating	**0.8604**	0.2379	0.2112
Walking around the home	**0.7897**	0.3604	0.2660
Managing prostheses	**0.7357**	0.1591	0.3690
Cutting toenails	**0.6156**	0.4182	0.2289
Walking 1 km	0.0879	**0.8865**	0.1457
Walking 100 m	0.2963	**0.8337**	0.1909
Using transport	0.4032	**0.7145**	0.3956
Going up and down stairs	0.4159	**0.7103**	0.2402
Preparing a meal	0.3956	0.1754	**0.7860**
Washing clothes	0.3037	0.1752	**0.7622**
Grocery shopping	0.2966	0.5978	**0.6198**
Managing bank account	0.2049	0.4549	**0.5804**
Dealing with money	0.5221	0.4414	**0.5583**
Using the telephone	0.3769	0.3335	**0.4038**

Factor 1: Personal care
Factor 2: Medium to long distance mobility
Factor 3: Household chores/ another person doing the task for the elderly individual

daily life.[14] They also confirm that the so-called IADL, being more complex, generate more difficulty and require more assistance and are the first to compromise the elderly individual's independence.[9]

To estimate the prevalence of difficulty and need of help in large populations, questions should be avoided which give rise to answers which would be classed as invalid (non-response) because the individual does not feel the activity related to themselves (men who never wash clothes, individuals who are not able to visualize walking 1 km or those who have never used a prosthesis). Question should also be avoided which have a strong gender component, such as preparing meals and washing clothes, which are well-known to be related to cultural realities. Responses to these questions have more to do with the respondent being male or female, rich or poor than whether they are dependent or not. In this sense, the need for help in bathing, eating a meal or combing hair had less than 1% of non-response. Banking transactions, washing clothes and walking 1km had more than 19% non-response. Over 20% of the sample gave an invalid response when asked about managing a prosthesis.

Factor analysis of the responses to the two dimensions of functionality studied (difficulty and need for help in carrying out the activities) showed final models with the activities grouped into three factors. However, in the model for difficulty, the boundaries between the groups do not allow the constructs generating this grouping to be seen clearly. This may be because of the lack of clear distinctions between the difficulties reported by the elderly individuals in carrying out the ADL. Questions about difficulties require new studies.

The three factors into which the activities are grouped in the factor analysis of need for help permit a clearer view of the constructs involved in the elderly individuals' perception of dependence. The first construct is represented by essential personal needs, such as getting into and out of bed, combing hair, bathing and dressing that, when help is needed in carrying them out, require the presence of another person, be that spouse, family member or formal carer who collaborates in such activities being carried out with some safety and regularity. Although the need for help with such activities affects a minority of the population, it indicates an extreme situation in which the elderly individual can effectively no longer live alone. This has huge repercussions on their quality of life, and on that of the carers and family involved and should be the focus of monitoring and prevention of health problems. Combing hair and getting dressed may not be of vital necessity, but gender bias may make them more important for women than for men. Personal activities are those which had the lowest rates of non-response, reinforcing the idea that this construct of dependence if clear to all and facilitates the subjective definition of the subject when asked whether or not they need help to carry out these activities. The two personal activities with the highest eigenvalues, and one of which was completely simple to carry out, (get into and out of bed) and one which was more complex (bathing), were chosen to reduce to the lowest number the activities which represented this construct, both with close eigenvalues.

The activities in the second factor with the highest eigenvalues were: walking 1 km, walking 100m, using transport and going up and down stairs. In this factor, entitled medium to long distance mobility activities which could not be carried out by another person but could be facilitated by orthotics and prosthetics were grouped together. They are activities which are the means of carrying out the majority of the IADL and indicate the individual's ability to get around. They are activities which allow the level of independence outside of the home to be inferred. Of the two highest eigenvalues, walking 100m had the most valid responses, indicating better comprehension of this activity.

The IADL were grouped into factor three "activities which another person could do for the elderly individual", whose eigenvalues, even in the highest quartile, were lower than those of the first factor. The activity with the highest eigenvalue in this construct was preparing a meal, followed by washing clothes and grocery shopping. Factor analysis made it possible to better understand the problems with this type of question. One of these is the fact that the eigenvalues are not high enough to be chosen as typical, as they coincide with topics which permeate more than one factor, probably due to gender, cultural and social bias which affects the responses to these activities. They are also activities with high levels of non-response, such as washing clothes and banking transactions.

Three questions mark, statistically and conceptually, the elderly individual's need for formal and informal care: two indicate personal needs (bathing and getting in and out of bed) and one indicates mobility (walking 100m outside of the home). With these three questions, it is possible to trace a line of dependence, which starts with declining mobility – help with walking 100 meters (and probably with all activities outside of the home) –, followed by the need for help bathing (and other domestic chores) and ends with the need for help getting in and out of bed – which probably identifies the individual in need of someone permanently by his/her side.

Thinking about the use of an instrument as a screening tool to estimate the demand for formal and informal care in primary care for elderly individuals living in the community, we suggest a simplified questionnaire comprised of the following questions: "Do you need help to walk 100 meters?"; "Do you need help with bathing?"; "Do you need help getting in or out of bed?".

This is a screening instrument with a score varying between zero and three; 0 – a totally independent individual with no need for day to day help; 1 – individuals with limited mobility who may be dependent on help to carry out IADL both in and outside of the home; 2 – needs some help within the home for personal activities; and 3 – highly dependent individual who needs full time help. These three activities make up a simple and reliable screening instrument which identifies groups at risk of needing help and contributes to the planning and managing of health care services within the new paradigm of chronic diseases and aging population.

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