



SURVEY QUESTION BANK: Topic Overview 5 (September 2011)

PHYSICAL FUNCTIONING IN OLDER ADULTS

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1. Why measure physical function in older adults?

Measuring physical function in older adults is useful for three reasons:

First, measures of physical function serve as indicators of current *health status*. Assessing someone's capacity to complete a standard performance test, or battery of tests, or asking them about their ability to complete certain activities, gives us a measure of their health that is not specific to a particular disease or condition. (Examples of the performance tests used and activities asked about in this context are given below.) In clinical practice, where they originated, measures of physical function are used as part of a comprehensive assessment alongside other forms of examination. (Applegate 1990) In population-based research, measures of physical function can be used to compare within or across groups whose members have been administered the same test or asked the same questions, allowing us to assess the health and function associated with different factors: for example, to compare mean levels of function in younger and older people, to compare physical function in men and women, or to compare levels in people who have received different levels of education. Where surveys have a longitudinal aspect and are repeated over time, repeated measures of physical function allow us to track trajectories within groups and in relation to risk factors.

Second, measures of physical function have *prognostic value* – that is, they predict future health and other outcomes (or at least can be used to estimate the risk of these outcomes). In older people, level of physical function is a good predictor of

subsequent disability and people with poor levels of physical function are more likely to go on to become disabled than those with high levels. For example, in a group of people aged 70 and over in the US who had generally good health and function (they were able to walk half a mile and climb stairs unassisted, and had no problem performing everyday activities), those who performed worst on a set of tests of physical function (incorporating balance, walking speed, and time taken to get up from a sitting position repeatedly) were more than four times as likely to have a disability when the same people were re-assessed four years later.(Guralnik 1995) For a different measure, grip strength, performance in midlife (ages 45 to 68) was related to likelihood of disability 25 years later.(Rantanen 1999) Physical function in older adults is also predictive of mortality.(Guralnik 1994; Cooper 2010)

Third, physical function is *predictive of health- and social-care use*, including nursing home admission (Guralnik 1994) and hospitalization (Cawthon 2009; Penninx 2000) as well as loss of independence more broadly.(Beswick 2008) Research on these topics may be of interest to policy-makers concerned with predicting or reducing levels of future care usage within specific populations.

Survey data incorporating assessment of physical function may be used for descriptive or for analytic purposes. When used for descriptive purposes, cross-sectional data may be used to estimate the prevalence of reduced physical function within a population and longitudinal data may be used to estimate incidence.(e.g. Freedman 2002) Used analytically, such data can be used to assess correlates, possible causes, and consequences of poor function. For example, analyses of this type have examined relationships between physical function and social inequalities (Syddall 2009); neighbourhood environment (Balfour 2002; Lang 2008); visual impairment (Salive 1994; Rubin 1994); obesity (Coakley 1998; Stenholm 2010); levels of social engagement (Mendes de Leon 2003); health literacy (Wolf 2005); alcohol consumption (Lang 2007); lifestyle activity and exercise (Brach 2004); and so on.

2. Assessing physical function

For the purposes of social and health research, physical functioning in older adults is measured either through self-report (or proxy report, if an individual is unable to report their own status) or through the use of standardized performance measures.(Guralnik 1989)

2.1 Self-reported function

Self-reported function typically relates to three types of function:

- **Activities of Daily Living (ADLs).** In clinical practice, assessment of Activities of Daily Living allows a therapist or practitioner to gauge an individual's

capacity to perform everyday tasks and may be assessed in hospital, in the individual's own home, or in some other setting. In a clinical context capacity to complete ADLs is often observed and includes a wide range of activities: the Assessment of Motor and Process Skills, which is supported by the US National Institutes on Aging and the American Occupational Therapy Foundation and Association, lists over 100 standardized ADL tasks (see <http://www.ampsintl.com/AMPS/>).

Shorter lists of tasks are used for summary purposes. The Katz Index of Independence in Activities of Daily Living (http://www.npcrc.org/usr_doc/adhoc/functionalstatus/Katz%20Index%20of%20Independence%20in%20Activities%20of%20Daily%20Living.pdf) lists six activities (bathing, dressing, toileting, transferring, continence, and feeding) (Katz 1963). The clinician or practitioner scores an individual 0 or 1 on each activity to give a score between 0 (very dependent) and 6 (independent). The Barthel Index (<http://www.medicaleducation.co.uk/resources/Barthel.pdf>) covers more domains (bowels; bladder; grooming; toilet use; feeding; transfer; mobility; dressing; stairs) and has a more complex scoring system. (Mahoney 1965)

In survey-based research, capacity to perform ADLs is usually based on self-report (though the questions may be asked of a proxy respondent) and limited to a small set of activities. For example, participants in the English Longitudinal Study of Ageing (ELSA) are asked whether they have difficulty doing each of six functional ADLs: dressing, including putting on shoes and socks; walking across a room; bathing or showering; eating, such as cutting up your food; getting in or out of bed; and using the toilet, including getting up or down.

HeADLb @

SHOW CARD M

Here are a few more everyday activities. Please tell me if you have any difficulty with these because of a physical, mental, emotional or memory problem. Again exclude any difficulties you expect to last less than three months.

Because of a health or memory problem, do you have difficulty doing any of the activities on this card?

PROBE : What others? CODE ALL THAT APPLY

- 1 Dressing, including putting on shoes and socks
- 2 Walking across a room
- 3 Bathing or showering
- 4 Eating, such as cutting up your food
- 5 Getting in or out of bed
- 6 Using the toilet, including getting up or down
- 7 Using a map to figure out how to get around in a strange place
- 8 Preparing a hot meal
- 9 Shopping for groceries
- 10 Making telephone calls
- 11 Taking medications
- 12 Doing work around the house or garden
- 13 Managing money, such as paying bills and keeping track of expenses
- 96 None of these [Exclusive code]

- **Instrumental Activities of Daily Living (IADLs)** are used to assess independent living skills that are more complex than the basic ADLs. The Lawson-Brody scale is one assessment tool for IADLs and covers using the telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medications, and ability to handle finances. A score from 0 to 8 is calculated based on capacity to perform these activities; sometimes a score of 0 to 5 is used for men and their ability to perform food preparation, laundering, and housekeeping are omitted.

As with ADLs, assessment of IADLs in survey-based research usually involves self- or (proxy-) report rather than a rating by a clinician or therapist. To use the same survey as an example, participants in the ELSA are asked whether they have difficulties in using the toilet, including getting up or down; using a map to figure out how to get around in a strange place; preparing a hot meal; shopping for groceries; making telephone calls; taking medications; doing work around the house or garden; and managing money, such as paying bills and keeping track of expenses.

- **Mobility.** In survey-based research, questions about mobility are sometimes considered to be ADLs and sometimes considered separately. In the ELSA mobility-related ADLs include walking quarter of a mile, walking 100 yards, climbing one flight of stairs without resting, and pulling or pushing large objects like a living room chair.

Shortcomings in using self-reported ability to perform tasks, including reporting biases of various types, limit both the internal and external validity of data on ADLs and IADLs from surveys. This should be kept in mind when analysing data and interpreting findings from surveys of this type.

2.2 Measured function

A range of aspects of physical function is directly measured in survey-based research. Such measures are more difficult and costly to perform than self-reported function because they require the presence of a trained assessor and have to be performed according to a pre-established set of criteria to ensure fidelity. They have the advantage of removing reporting bias and providing a more objective assessment of function.

Aspects of function measured include:

- **Walk speed** (sometimes called gait speed). This is assessed over courses of various lengths: for example, the US Health ABC study assesses both distance walked in two minutes and time taken to walk 400 metres;(Simonsick 2001), the ELSA involves a timed walk of eight feet (Gardener 2005), and the US

Health and Retirement Study involves a timed walk of 98.5 inches (Crimmins et al. 2008)

- **Tests of balance.** Balance in later life is of interest because it is related to mobility and risk of falling (Vellas 1997; Thorbahn 1996) and because it is potentially amenable to improvement through training (Barnett 2003; Lord 1995). A standard test of balance is the Berg Balance Scale (Berg 1992), which uses 14 items to assess risk of falling. The Berg Scale was designed for use in clinical settings, where it takes 15 to 20 minutes to administer (see http://www.aahf.info/pdf/Berg_Balance_Scale.pdf), and balance tests in survey or epidemiological studies often use selected items from the full 14-item scale. For example, balance in the ELSA uses five items from, or derived from, the Berg Scale: side-by-side stand, semi-tandem stand, full-tandem stand, leg raise, and leg raise (eyes closed) (Stevens 2008) and the Health and Retirement Study uses the first three of these.
- **Grip strength** is a measure of upper-body muscle strength that has been proposed as a single marker of frailty (Syddall 2003) and health-related quality of life (Sayer 2006). It is assessed using a dynamometer and measured in studies including the Hertfordshire 1920-29 cohort, the ELSA, the Health and Retirement Study, and the Study of Health, Ageing and Retirement in Europe.
- **Sit-to-stand tests** (sometimes called chair stands) involve participants standing up from and sitting down in a standard chair a set number of times (usually five or ten) (Csuka 1985). Designed as a test of lower-limb strength, performance on these tests also relates to factors associated with other physiological and psychological factors including balance and sensation (Lord 2002). Sit-to-stand times are measured in the ELSA.
- the **“get-up and go”** (Mathias 1986) and **“timed-up-and-go”** (Podsiadio 1991) combine elements of the sit-to-stand and walk speed tests. These involve getting up from a chair and walking three meters, turning around, then returning to the chair and sitting down again. The timed-up-and-go is assessed in the Canadian Study of Health and Aging (Rockwood 2000)
- The **Short Physical Performance Battery** (SPPB – see <http://www.grc.nia.nih.gov/branches/ledb/sppb/>) combines information from balance, sit-to-stand, and gait speed tests to assess lower extremity function in older people and has been shown to be associated with self-reported disability and predictive of mortality and institutionalization (Guralnik 1994). The SPPB can be calculated in datasets containing all the relevant components such as the Established Populations for the Epidemiologic Study of the Elderly (EPSE, <http://www.nia.nih.gov/NR/rdonlyres/6FD06362-76A9-40F9-A06B->

[B1756186124D/0/EPESSE.pdf](#)), InCHIANTI study
(<http://www.inchiantistudy.net/bindex.html>), and the ELSA.

This list contains only some of the measures and scales related to physical function in use; others include functional reach,(Duncan 1990) the Tinetti Performance Oriented Mobility Assessment (POMA),(Tinetti 1986) and the continuous-scale physical functional performance test (CS-PFP).(Cress 1996) There is also an extensive literature on the assessment and performance of different measures in different populations, and on comparing and contrasting different aspects of function, both measured and self-reported (for example, see Den Ouden 2011 and Cooper 2011 for recent reviews). Comparisons of self-reported and measured physical function have indicated that they do not necessarily correlate well and are measuring different aspects of function (Reuben 1995) though the correspondence will vary according to the specific measured and self-reported aspects of function compared.

3. Existing survey questions

Questions on and measures of physical functioning appear in many surveys that assess older people's health and only a few of these are discussed here. Among the surveys on which data is available through the Economic and Social Data Service, physical functioning has been covered in the Health Survey for England (HSE) and the English Longitudinal Survey for Ageing (ELSA).

The HSE is a cross-sectional survey of health and related topics in those living in private households in England. Questions on physical functioning appeared in the Health Surveys for England in 1995, 2000, 2001, and 2005. The same questions have not been asked every time, limiting the options for making comparisons over time. HSE 2005 included measures of function: grip strength, walking speed, balance, leg raises, and chair raises. (The response rate was lower for the measured function items than for the questions.)

1995/2000/2001 HSE physical function questions (self-reports)

ASK ALL AGED 10+

DisIntA (*included in proxy interview*)

SHOW CARD F.

Do any of the things on this card apply to you? Please read all the things on the card before telling me.

INTERVIEWER: DO NOT INCLUDE TEMPORARY DISABILITIES, IE PROBLEMS EXPECTED TO LAST LESS THAN ONE YEAR.

- 1 Yes
- 2 No

IF (DisIntA = Yes) THEN

DisAbA (*included in proxy interview*)

Which ones apply to you? Just tell me the numbers.

CODE ALL THAT APPLY.

- 1 Cannot walk 200 yards or more on own without stopping or discomfort (WITH WALKING AID IF NORMALLY USED)
- 2 Cannot walk up and down a flight of 12 stairs without resting
- 3 Cannot follow a TV programme at a volume others find acceptable (WITH HEARING AID IF NORMALLY WORN)
- 4 Cannot see well enough to recognise a friend across a road (four yards away) (WITH GLASSES OR CONTACT LENSES IF NORMALLY WORN)
- 5 Cannot speak without difficulty

ENDIF

...

ASK ALL AGED 10+

DisIntB (*included in proxy interview*)

SHOW CARD G.

Do any of the things on this card apply to you? Please read all the things on the card before telling me.

INTERVIEWER: DO NOT INCLUDE TEMPORARY DISABILITIES, I.E. PROBLEMS EXPECTED TO LAST LESS THAN ONE YEAR.

- 1 Yes
- 2 No

IF (DisIntB = Yes) THEN

DisAbB (*included in proxy interview*)

Which ones apply to (you)? Just tell me the numbers.

CODE ALL THAT APPLY.

- 1 Cannot get in and out of bed on own without difficulty
- 2 Cannot get in and out of a chair without difficulty
- 3 Cannot bend down and pick up a shoe from the floor when standing
- 4 Cannot dress and undress without difficulty
- 5 Cannot wash hands and face without difficulty
- 6 Cannot feed, including cutting up food without difficulty
- 7 Cannot get to and use toilet on own without difficulty
- 8 Have problem communicating with other people - that is, have problem understanding them or being understood by them

ENDIF

2005 HSE physical function questions (self-reports)

Now we would like to know how your health is **today**.

Please answer **ALL** the questions. By ticking one box for each question below, please indicate which statements best describe your own health state **today**.

Spare 21-200

Q1 Mobility

Tick one box

201

I have no problems in walking about

 1

I have some problems in walking about

 2

I am confined to bed

 3

Q2 Self-Care

Tick one box

202

I have no problems with self-care

 1

I have some problems washing or dressing myself

 2

I am unable to wash or dress myself

 3

Q3 Usual activities

Tick one box

203

I have no problems with performing my usual activities
(eg. work, study, housework, family or leisure activities)

 1

I have some problems with performing my usual activities

 2

I am unable to perform my usual activities

 3

The ELSA is a panel study of older people in England. It contains detailed information about physical functioning and includes both subjective and measured function. At the time of writing, four waves of this data (from 2002, 2004, 2006, and 2008) are available and this enables participants to be followed over time (though not all measures are contained in every wave).

The physical functioning items in the ELSA were intended to allow comparison with other studies including the US Health and Retirement Study (HRS) and the Survey of Health, Ageing and Retirement in Europe (SHARE). The Health and Retirement Study is a nationally representative study of the non-institutionalized US population aged 50 and older. It has been running every two years since 1998, with some earlier

data also available; initial waves were conducted by telephone so were limited to self-reported physical function but later waves included a face-to-face component and measured physical function was added. SHARE is a multidisciplinary study of older people in Europe: participants from 11 countries were included in the first wave in 2004; participants from 14 countries participated in 2008-09. Comparisons including physical function data from the ELSA, the SHARE, and the HRS have been published (e.g. Crimmins 2010, Lang 2007).

Data and documentation from both the HRS and SHARE are accessible online. For further information see <http://hrsonline.isr.umich.edu/> and <http://www.share-project.org/>.

4. Important future developments in the measurement of physical function

Study of physical function in older people is a well established field with a large and growing literature. Two ongoing developments are bringing studies together (for synthesis or for comparison) and working with populations about which comparatively little is known.

Comparing across populations, which includes comparing across national boundaries, can be useful in terms of descriptive epidemiology (i.e. to compare levels of functional impairment in different populations, to assess the contextual effects of independent variables, and to allow us to infer the consequences of contextual differences).

Comparing across populations based on different studies presents challenges in terms of measurement and methods. These may relate, for example, to differences in:

- mode of administration
- language, especially (though not only) when different languages have been used
- inclusion/exclusion criteria (for tests)
- inclusion/exclusion criteria (for analysis)
- response rates – overall and item-specific.

Use of surveys designed to permit comparisons across populations makes these issues less of a problem (though does not remove the problems entirely). For example, Avendano and colleagues compared prevalences of six chronic diseases and of functional limitations in the US and Europe (Avendano 2009) using data from the ELSA, HRS, and SHARE studies, which were designed to enable comparison to be made. Other comparisons using these datasets have focused on disease prevalence (Banks 2006), cognitive health (Langa 2009), and depression. (Zivin 2009) As well as comparing across populations recent work has been focused on synthesizing and aligning cohorts. For example, the HALCyon collaborative research programme

(www.halcyon.ac.uk) is a cross-disciplinary research undertaking to bring together data from nine cohort studies in order to better understand healthy ageing.

Common to a lot of this work is the recognition that comparing studies presents challenges – even when focusing on a single measure such as grip strength, variation in assessment methods across studies makes direct comparisons difficult.(Roberts 2011) One way of addressing potential differences in the reporting of self-reported health status is by using anchoring vignettes, which are intended to make comparison more meaningful by asking respondents to rate the health of individuals in differing health states and using these to calibrate the responses they give to questions about their own health status.(e.g. Beam Dowd 2011) Vignettes are a relatively new component of health surveys but have now appeared in some major cohorts and enable a new approach to interpreting differences both within and across studies.

In terms of novel work there is much to be done in countries in which surveys assessing physical function in older people have been scarce or absent. These are typically low- or middle-income countries. The World Health Organization's Study on Global AGEing and Adult Health (SAGE) is gathering data from nationally representative samples in six countries (China, Ghana, India, Mexico, Russian Federation and South Africa) (see <http://www.who.int/healthinfo/systems/sage/en/index.html>). Some of the survey instruments used in SAGE have been adapted from those in existing surveys of ageing, including the HRS and ELSA, and the health and vignettes questions are the same as those in SHARE so the availability of these data offers new opportunities for comparative analysis.

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