

Reliability and validity of the Turkish version of the Nottingham Extended Activities of Daily Living Scale

Fusun Sahin, Figen Yilmaz, Asli Ozmaden, Nurdan Kotevoglul, Tulay Sahin and Banu Kuran

Sisli Etfal Education and Research Hospital, Department of Physical and Rehabilitation Medicine, Istanbul, Turkey

ABSTRACT. Background and aims: The aim of this study was to develop a Turkish version of the Nottingham Extended Activities of Daily Living Scale (NEADLS) and to assess its reliability and validity. **Methods:** Sixty healthy volunteers over 67 years old were included in the study. After translation, the Turkish version of the scale was filled in by each participant over a period of 2 weeks. Reliability was assessed by internal consistency, test-retest intraclass correlation coefficient (ICC) and Spearman's correlation. Converging validity was determined correlating the scale with the Modified Barthel Index (MBI). **Results:** The mean age of participants was 77±5.67 years. In the reliability studies, internal consistency within the subsections and items of the NEADLS was good and very good, with Cronbach's α values ranging between 0.84-0.93 and 0.74-0.97 respectively. The Cronbach's α for the total NEADLS score was also determined as 0.97. Test-retest intraclass correlation coefficients, determined as 0.97 in total score, ranged from 0.84-0.97 between items. The converging validity study for the NEADLS total score was correlated with the MBI and the r value was found statistically significant ($r=0.84$, $p<0.0001$). **Conclusions:** The Turkish version of the NEADLS is a reliable and valid scale and can be used in activities of daily living assessment of Turkish elderly persons.

(Aging Clin Exp Res 2008; 20: ####-####)

©2008, Editrice Kurtis

INTRODUCTION

Outcome measurement scales are used to measure disability and quality of life, as well as to evaluate the rehabilitation period. Each country can develop these measurement parameters according to the characteristics of each illness in its own social and cultural setting. Instead, making comparisons between similar studies on an international scale and communicating between different dis-

ciplines requires the same scales to be used. Translation and cultural adaptation of widely accepted scales give an opportunity for standard evaluation. Translation and cultural adaptation steps can also be achieved according to widely accepted procedures, in order to have validated instruments (1-4).

The primary clinical aims of every field of rehabilitation are to decrease disability, to increase adaptation in order to enhance quality of life, and to provide independence. However, it is not easy to define "independence" in daily living activities. Disabilities should ideally be assessed considering all aspects of daily life, such as communications, social interactions, domestic tasks, work, and leisure time activities. Evaluation scales such as the "Instrumental Activity of Daily Living" or "Extended Activity of Daily Living" have been developed for this purpose (1).

The Nottingham Extended Activities of Daily Living Scale (NEADLS) was originally designed in the UK, and it is also one of the most popular extended activities of daily living scales in rehabilitation centers in the UK (5). It was originally developed for stroke patients (6), but was also used for such differing disease states as multiple sclerosis (MS) (7), chronic obstructive pulmonary disease (8), heart failure (9) and total hip replacement (10). In addition, it is used to monitor rehabilitation programs for aging individuals and stroke patients (11-14).

NEADLS consists of 4 subsections; mobility (6 items), kitchen (5 items), domestic (5 items), and leisure time activities (6 items). Responses to all questions are evaluated as: not performed, 0 point; with help, 1 point; on my own with difficulty, 2 points; on my own easily, 3 points. For each subsection total, and with summation of all scores, final total NEADLS scores are obtained, and range between 0 and 66 points. The NEADLS can be used by mail or personal interview (1, 6).

The aim of this study was to examine the Turkish trans-

Key words: Elderly, extended daily life activities, outcome measurement, rehabilitation.

Correspondence: Fusun Sahin, Sisli Etfal Education and Research Hospital, Dept. of Physical and Rehabilitation Medicine, Serakent Sitesi Menekse Blok No 14 Daire 40 Kagithane, Istanbul, Turkey.
E-mail: drfusunsahin@yahoo.com.tr

Received May 16, 2007; accepted in revised form January 3, 2008.

Table 1 - Turkish version of the Nottingham Extended Activities of Daily Living Scale.

NOTTINGHAM GENİŞLETİLMİŞ GÜNLÜK YAŞAM AKTİVİTELERİ İNDEKSİ				
AKTİVİTE	Hiç yapamıyorum (0)	Yardım alarak (1)	Tek başına Zorlanarak (2)	Tek başına kolayca (3)
HAREKET				
Dışarıda yürür müsünüz?				
Merdiven çıkar mısınız?				
Arabaya binip iner misiniz?				
Engibeli yolda yürür müsünüz?				
Karşıdan karşıya geçer misiniz?				
Toplu taşıma araçlarına biner misiniz?				
MUTFAKTA				
Yemeğinizi kendiniz mi yersiniz?				
Kendinize sıcak içecek yapar mısınız?				
Bir odadan diğerine sıcak içecek taşır mısınız?				
Bulaşıkları yıkar mısınız?				
Kendinize atıştırarak sıcak bir şeyler yapar mısınız?				
EV İŞLERİ				
Dışarı çıktığınızda kendi paranızı idare edebiliyor musunuz?				
Ufak tefek çamaşırları yıkar mısınız?				
Ev işlerinizi yapabilir misiniz?				
Kendi alışverişinizi yapar mısınız?				
Bütün çamaşırları yıkar mısınız?				
BOŞ ZAMAN AKTİVİTELERİ				
Gazete ya da kitap okur musunuz?				
Telefon kullanabilir misiniz?				
Mektup yazar mısınız?				
Dışarı çıkıp insanlarla görüşür müsünüz?				
Bahçenizle, çiçek, evcil hayvan bakımı ile uğraşır mısınız ?				
Araba kullanır mısınız?				

lation of the NEADLS (Table 1), and its adaptation to the Turkish population, and to establish its reliability and validity.

MATERIALS AND METHODS

Patients

The study enrolled 60 patients aged over 67. Those assisting patients referred to the clinics of our hospital, and residents of the Etiler Healthcare and Convalescent Home (Istanbul) who agreed to participate in the study were included. Patients with dementia, aphasia or Alzheimer's disease, and non-Turkish speaking people were excluded.

Evaluation parameters

During the first examination, the subject's age, gender, level of education, occupation, walking aids (if any), current illnesses, and drugs taken were recorded.

Other parameters used during evaluation were as follows. *Functional ambulation category (FAC) (15)*: Levels

were defined as follows: level 0, the patient cannot walk at all, or requires the help of two or more persons; level 1, the patient needs continuous support from one person, who helps to carry the patient's weight and helps with balance; level 2, the patient is dependent on the continuous or intermittent support of one person to help with balance or coordination; level 3, the patient needs only verbal supervision; level 4, help is required on stairs and uneven surfaces; level 5, the patient can walk independently anywhere. The FAC test was based on a walking distance of 15 m.

The *level of ambulation* was defined in three different levels: 1) the subject cannot go outside, is fully dependent for daily living activities, 2) independently ambulated and functional at home, dependent for outdoor activities, cannot go outside unless it is absolutely necessary, 3) independent both at home and outdoors, can accomplish all activities alone.

In addition, each individual's self-perception of overall well-being was ascertained and recorded. Classification was made according to the Likert scale and categories were: 1) my health is excellent; 2) my health is very good; 3) my health is good; 4) my health is fair; 5) my health is poor.

For *disability evaluation*, the Modified Barthel Index (MBI) was used, an assessment scale evaluating performance in daily living activities, the validity and reliability of which in the Turkish language has been established (16). MBI is a daily living activity assessment test consisting of 10 activities, all of which are scored on a 5-stage basis with respect to the physical assistance required. Activities included in assessments were transfer, walking, climbing up and down steps, eating, dressing, personal self-care, bathing, sitting on and getting up from the lavatory, urinary and/or fecal incontinence.

Translation procedure

The previously published recommendations of Guillemin et al. (17), Beaton et al. (18) and the EORTC Quality of Life Group (19) were used for the Turkish version and cross-cultural adaptation of the NEADLS.

As the first step, a native Turkish speaker fluent in English, and two specialists (one physiatrician, and one rheumatologist) independently translated the English version of the NEADLS into Turkish. Discrepancies were eliminated with the assistance of a third independent translator. The Turkish version of the scale was then translated back into English by two English-speaking language specialists who were blinded to the original scale and to the aim of the study. The differences between the translated versions were settled, and satisfactory compliance with the original scale was achieved.

Reliability and validity study

Reliability studies covered estimation of internal consistency and test-retest reliability. Internal consistency was expressed as Cronbach's α coefficient, and every item was assessed for each subsection and total scores. A Cronbach's α coefficient of ≥ 0.7 was deemed as acceptable internal consistency (20). To determine test-retest reliability, the final Turkish version of the scale was completed by 60 participants at 2-week intervals, and the intraclass correlation coefficient (ICC) was assessed with median values between 2 measurements.

In all statistical analyses, the value of the correlation coefficient was considered with no or poor (0-0.25 pts), moderate (0.26-0.50 pts), good (0.51-0.75 pts), and very good 0.76-1.00 pts).

To reveal converging validity, the MBI whose Turkish version had previously established validity and reliability was used (16). MBI was preferred for the following reasons: it is the best scale for evaluation of disability (1), the validity and reliability of the Turkish version is established (16), and it has higher inter-rater correspondence (21). Cronbach's

α coefficient of the Turkish version of MBI for stroke patients was found to be 0.93, with ICC 0.99 (16).

Statistical analysis

All statistical analyses were performed with the NCSS 2007 package program. Besides descriptive statistically methods (mean \pm standard error), reliability studies were performed by internal consistency (Cronbach's α) and test-retest reliability. Cronbach's α was used for each item, subsection and total score and, if Cronbach's α value was greater than 0.7, it was considered as an acceptable internal consistency. Test-retest reliability was assessed by determining the intraclass correlation coefficient (ICC) and confidence interval (95%). The consistency of each item between two successive tests was measured by Spearman's correlation test. A validation study was performed with converging relationships between NEADLS and MBI. A level of $p < 0.05$ was considered statistically significant.

RESULTS

Forty-five women, and 15 men participated in the study. Participants whose mean age was 77 ± 5.67 years (range 67-92 yrs), consisted of 25 housewives and pen-

Table 2 - Demographic and general assessment data.

	Patient (n)	%
Gender		
Male	15	25
Female	45	75
Education		
Literate	4	6.7
Primary school	22	36.7
High school	20	33.3
University	14	23.3
Walking aids		
Cane	11	18.3
Lofstrand	3	5
None	46	76.6
Living place		
Own home	19	31.6
With Relatives	2	3.3
Nursing Home	39	65
FAC*		
Needs one person's help	6	5.2
Needs verbal supervision	10	8.7
Help required outdoors	8	7
Independent	91	79.1
Level of ambulation		
Dependent at home	2	3.3
Dependent outdoor	10	16.6
Independent	48	80
General health status		
Excellent	1	1.6
Very good	30	50
Good	24	40
Fair	5	8.3

*FAC, functional ambulation categories.



Table 3 - Subsections of NEADLS* total scores and Cronbach's α coefficients of MBI†.

Total Scores	Cronbach's α coefficients
Mobility	0.93
Kitchen activities	0.91
Domestic tasks	0.84
Leisure time activities	0.85
NEADLS final	0.97
MBI	0.86

*NEADLS, Nottingham Extended Activities of Daily Living Scale; †MBI, Modified Barthel Index.

sioners retired from various occupations. They were literate (n=4; 6.7%), and graduates of primary school (n=22; 36.7%), high school (n=20; 33.3%) and university (n=14; 23.3%). Three participants had no medical problems. Other associated morbidities were summarized as: hypertension (n=27), cardiac disease (n=18), osteoporosis (n=14), osteoarthritis (n=12), diabetes mellitus (n=10), cerebrovascular accidents (n=5), thyroid disease (n=4), vertigo (n=4), pulmonary disease (n=3), rheumatoid arthritis (n=3), hypercholesterolemia (n=3), cardiovascular accidents (n=5), renal failure (n=1), pulmonary disease (n=3), Parkinson's disease (n=1), polyneuropathy (n=1) and epilepsy (n=1).

Nineteen participants were living in their own homes,

2 with relatives, and 39 in nursing homes. They were mostly using canes (n=11, 18.3%), and secondly only one sided Lofstrand forearm orthosis (n=3, 5%) as a walking aid. Forty-six participants did not use any walking aids (76.6%).

Assessments of FACs, ambulation levels, and general health status are listed in Table 2: 80% of patients had optimal FAC and ambulation levels, and 90.5% of them evaluated their general health status as very good to good.

Reliability and validity study

Internal consistencies (Cronbach's α) of the NEADLS subsections ranged between 0.84 and 0.93, while the total score was 0.97 (Table 3). However, Cronbach's α coefficient of each item changed between 0.74 and 0.97 (Table 4). These higher values points to an improved/higher level of internal consistency.

Test-retest reliability results are shown in Table 4. For test-retest reliability assessments, the ICC of NEADLS final total score was 0.97, ranging between 0.84-0.97 points among items (Table 4). For test-retest reliability evaluations, Spearman's correlation coefficient of items varied between 0.66-0.99 ($p < 0.0001$), and the total score was 0.97 ($p < 0.0001$). For the MBI, the test-retest correlation coefficient was 0.93 ($p < 0.0001$).

When assessed for converging validity, significant and positively strong correlations were detected between subsections of NEADLS total and MBI total scores

Table 4 - Test-retest reliability, internal consistency Cronbach's α values and Spearman's correlation coefficients related to grand total scores of each NEADLS* item.

	Test-retest reliability (intraclass correlation)	Spearman's Correlation	Internal consistency Cronbach's α values
Walk round outside	0.89 (0.82-0.93)	0.85	0.89
Climb stairs	0.84 (0.73-0.90)	0.75	0.84
Get in and out of the car	0.89 (0.82-0.94)	0.77	0.89
Walk over uneven ground	0.93 (0.89-0.96)	0.80	0.93
Cross roads	0.92 (0.86-0.95)	0.81	0.92
Travel on public transport	0.92 (0.87-0.95)	0.85	0.92
Manage to feed yourself	0.89 (0.81-0.93)	0.81	0.89
Make yourself a hot drink	0.96 (0.93-0.97)	0.72	0.96
Take hot drinks from one room to another	0.97 (0.95-0.98)	0.92	0.97
Wash the dishes	0.96 (0.93-0.98)	0.87	0.96
Make yourself a hot snack	0.88 (0.80-0.93)	0.73	0.88
Manage your own money when out of the home	0.97 (0.95-0.98)	0.84	0.97
Wash small items of clothing	0.85 (0.76-0.91)	0.66	0.86
Do your own housework	0.84 (0.72-0.89)	0.75	0.83
Do your own shopping	0.88 (0.80-0.93)	0.76	0.88
Do a full clothes wash	0.84 (0.69-0.88)	0.67	0.74
Read newspapers and books	0.94 (0.91-0.97)	0.84	0.95
Use the telephone	0.97 (0.95-0.98)	0.99	0.97
Write letters	0.94 (0.90-0.96)	0.76	0.94
Go out socially	0.88 (0.81-0.93)	0.71	0.88
Manage your own garden	0.89 (0.74-0.98)	0.73	0.90
Drive a car	0.96 (0.88-0.98)	0.93	0.96
Final Total Score	0.97 (0.96-0.98)	0.91	0.97

*NEADLS; Nottingham Extended Activities of Daily Living Scale.

Table 5 - Converging validity study of NEADLS with MBI.

		NEADLS *Final TS†	MBI‡ TS
Mobility TS†	r	0.89	0.71
	p	0.0001	0.0001
Kitchen activities TS	r	0.89	0.86
	p	0.0001	0.0001
Domestic tasks TS	r	0.95	0.81
	p	0.0001	0.0001
Leisure time activities TS	r	0.90	0.70
	p	0.0001	0.0001
NEADLS Final TS	r		0.84
	p		0.0001

*NEADLS, Nottingham Extended Activities of Daily Living Scale;
 †TS: Total score; ‡Modified Barthel Index.

($p < 0.0001$) (Table 5). The correlation coefficient (r) for total scores was 0.84 ($p < 0.0001$).

Participants were evaluated as female and male in order to discover any sex bias. There was no differences between either sex as regards mean age. The same is true for subsections and final total scores (Table 6).

DISCUSSION

If disabilities are detected in early stages by means of appropriate medical management, the hospital admissions and disabilities of elderly patients with higher risk can be reduced. In the rehabilitated elderly patient group, mean NEADLS and Barthel Index scores were found significantly better with respect to the control group after 12 months of treatment (21). However, the use of these valuable scales in any language and/or country requires the validity and reliability of its version in its native language to be ascertained. In our study, we planned to translate NEADLS into Turkish, and also to demonstrate its reliability in the Turkish population, in addition to establishing its validity by comparing its result with the original MBI with proven reliability.

After translation, participants filling in the Turkish version succeeded in responding to all items within an av-

erage of 8 minutes, and appreciated to its easily understandable format. During the test there was no need for an explanation of any item.

In NEADLS studies performed with various groups of patients, the reliability and validity of the test, especially in patients with stroke, have been established (6, 14, 22-26). Its validity and reliability have also been demonstrated in elderly patients with multiple sclerosis, hip arthritis, and those with hip replacement, who have a higher risk of falling (7, 10).

In one study, inter-rater reliability was assessed with physicians and non-medical staff as participants and good and excellent levels of reliability were reported with regard to scores obtained for both items and subsections (26).

Comparing the Cronbach's α coefficients of our study (Table 3), either validation study was performed in patients with multiple sclerosis or elderly patients with hip arthritis, the similar values for subsections and total scores were found (7, 10).

In our study, test-retest reliability is shown in Table 4. The ranges of scores in patients with multiple sclerosis or hip arthritis were 0.81-0.90 and 0.76-0.96, respectively. In all studies, acceptable internal consistency coefficients were found.

In the validation study, a significant correlation between all subsections of NEADLS, total score and MBI was detected (Table 5). Correlation coefficient (r) for total score was 0.84. In the hip arthritis study, the r value ranged between 0.79 and 0.90 (10). This significant correlation has been substantiated by other stroke studies (25, 26).

Since the daily activities of men and women are different, the subsections of the scale may have been affected, so that participants were re-evaluated according to their sex and their subsection and final scores were compared. There were no differences between groups. Hsueh et al. (24), although they did not report any bias due to sex, found that women were much more active in the kitchen and domestic subsections, whereas men were much more active in the leisure subsection.

In the functional disability assessment scales, in addition to determination of degree of disability, susceptibility to disease and identification of alterations in the disease process detected during treatment and follow-up period should also be emphasized. In patients who had total hip replacement surgery as a chronic disabling disease, significant changes were detected in NEADLS within 12 months, although the scale was not found to be sensitive to changes in comparison with the SF-36 and London Handicap Scale (10, 27). However, NEADLS did turn out to be sensitive to clinical changes in patients with stroke (28). Therefore, the establishment and surveillance of the Turkish version of NEADLS applied to various disease groups should be emphasized.

Table 6 - Comparison of the ages, NEADLS subsections and final score of male and female participants.

	Male (n=15)	Female (n=45)	p
Mean age (yrs)	77.2±6.5	76.8±5.2	>0.05
Mobility TS†	21.27±4.25	19.16±4.23	>0.05
Kitchen activities TS	18.13±4.09	18.8±2.57	>0.05
Domestic tasks TS	13±3.61	12.71±2.61	>0.05
Leisure time activities TS	20.2±5.07	18.13±4.09	>0.05
*NEADLS Final TS	72.6±16.29	68.8±12.02	>0.05

*NEADLS, The Nottingham Extended Activities of Daily Living Scale;
 †TS: Total score.

The results of this study indicate that the Turkish version of NEADLS is a reproducible, reliable and validated assessment tool for daily living activities in patients aged over 67, and also demonstrate its applicability in the field of geriatric rehabilitation.

ACKNOWLEDGEMENTS

We acknowledge the valuable assistance of Dr. Gülcan Erçetin, of the Bogazici University School of Foreign Languages, Department of English Language in the translation of the above-mentioned scales into Turkish. For the translation of the original Turkish article into English, our thanks go to Dr. Gürkan Kazanci of the Kazanci Medical Translation Bureau. We also thank biostatistician A. Rana Konyalioglu for statistical calculations, and for support for the study design at the beginning and throughout the study.

REFERENCES

- Wade DT. Measurement in neurological rehabilitation. Oxford: Oxford University Press, 1992.
- Guillemin F. Functional disability and quality of life assessment in clinical practice. *Rheumatology* 2000; 39: 17-23.
- Iwarsson S. Environmental influences on the cumulative structure of instrumental ADL: an example in osteoporosis patients in a Swedish rural district. *Clin Rehabil* 1998; 12: 221-7.
- Bullinger M, Alonso J, Apolone G, et al. Translating health status questionnaires and evaluating their quality: The IQOLA project approach. *J Clin Epidemiol* 1998; 51: 913-23.
- Turner-Stokes L, Turner-Stokes T. The use of standardized outcome measures in rehabilitation centers in the UK. *Clin Rehabil* 1997; 11: 306-13.
- Nouri FM, Lincoln NB. An extended activities of daily living scale for stroke patients. *Clin Rehabil* 1987; 1: 301-5.
- Nicholl CR, Lincoln NB, Playford ED. The reliability and validity of the Nottingham Extended Activities of Daily Living Scale in patients with multiple sclerosis. *Mult Scler* 2002; 8: 372-6.
- Garrod R, Bestall JC, Paul EA, Wedzicha JA, Jones PW. Development and validation of standardized measure of activity of daily living in patients with severe COPD: The London Chest Activity of Daily Living Scale (LCADL). *Respir Med* 2000; 94: 589-96.
- O'Mahony MS, Sim MFV, Ho SF, Steward JA, Buchalter M, Burr M. Diastolic heart failure in older people. *Age Ageing* 2003; 32: 519-24.
- Harwood RH, Ebrahim S. The validity, reliability and responsiveness of the Nottingham Extended Activities of Daily Living Scale in patients undergoing total hip replacement. *Disabil Rehabil* 2002; 24: 371-7.
- Hershkovitz A, Gottlieb D, Beloosesky Y, Brill S. Program evaluation of a geriatric rehabilitation day hospital. *Clin Rehabil* 2003; 17: 750-5.
- Young JB, Robinson M, Chell S, et al. A whole system study of intermediate care services for older people. *Age Ageing* 2005; 34: 577-83.
- Fleming SA, Blake A, Gladman JRF, et al. A randomized controlled trial of a care home rehabilitation service to reduce long-term institutionalization for elderly people. *Age Ageing* 2004; 33: 384-90.
- Lincoln NB, Gladman JRF. The Extended Activities of Daily Living Scale: further validation. *Disabil Rehabil* 1992; 14: 41-3.
- Holden MK, Gill KM, Magliozzi MR. Gait assessment for neurologically impaired patients. Standards for outcome assessment. *Physical Ther* 1986; 66: 1530-9.
- Kucukdeveci A, Yavuzer G, Tennant A, Suldur B, Sonel B, Arasil T. Adaptation of the Modified Barthel Index for use in physical medicine and rehabilitation in Turkey. *Scand J Rehabil Med* 2000; 32: 87-92.
- Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of the health-related quality of life measures: literature review and proposed guidelines. *J Clin Epidemiol* 1993; 46: 1417-32.
- Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self report measures. *Spine* 2000; 25: 3186-91.
- Cull A, Sprangers M, Bjordal K, Aaronson N, West K, Bottomley A. EORTC Quality of life Group Translation Procedure, 2002. Web site: <http://www.eortc.be/home/qol/Manuals.htm>
- DeVellis RF. Scale Development: theory and applications. Newbury Park, CA: Sage Publications, 1991.
- Stott DJ, BATTERY AK, Bowman A, et al. Comprehensive geriatric assessment and home-based rehabilitation for elderly people with a history of recurrent non-elective hospital admissions. *Age Ageing* 2006; 35: 487-91.
- Gompertz P, Pound P, Ebrahim S. The reliability of stroke outcomes. *Clin Rehabil* 1993; 7: 290-6.
- Towle D. Use of the "Extended Activities of Daily Living Scale" with depressed stroke patients. *Int Disabil Stud* 1998; 10: 148-9.
- Hsueh IP, Huang SL, Chen MH, Jush SD, Hsieh CL. Evaluation of stroke patients with the Extended Activities of Daily Living Scale in Taiwan. *Disabil Rehabil* 2000; 22: 495-500.
- Gladman JRF, Lincoln NB, Adams S. Use of the extended ADL scale with stroke patients activities of daily living. *Age Ageing* 1993; 22: 419-24.
- Schlote A, Kruger J, Topp H, Wallesch CW. Inter-rater reliability of the Barthel Index, the Activity Index, and the Nottingham Extended Activities of Daily Living: The use of ADL instruments in stroke rehabilitation by medical and non-medical personnel. *Rehabilitation (Stuttg)* 2004; 43: 74-82.
- Harwood RH, Ebrahim S. A comparison of the responsiveness of the Nottingham Extended Activities of Daily Living Scale, London Handicap Scale and SF-36. *Disabil Rehabil* 2000; 22: 786-93.
- Gompertz P, Pound P, Ebrahim S. Validity of the Extended Activities of Daily Living Scale. *Clin Rehabil* 1994; 8: 275-80.