

The Arabic Translation and Cross-Cultural Adaptation of The Bristol Activity of Daily Living Scale

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Abstract

Background:

There are few Arabic language functional scales for patients with dementia. The Bristol Activity of Daily Living Scale (BADLS) was designed and validated for use in patients with dementia.

Objective:

Our study aimed to translate, cross-culturally adapt, and validate the BADLS to the Arabic language for people with neurocognitive decline and dementia.

Methods:

The original BADLS scale was translated to the Arabic language followed by face validity assessment through a pilot testing in five Arabic countries. The Arabic BADLS was assessed in a sample of 139 participants and their caregivers for concurrent and convergent validity.

Results:

The Arabic BADLS had excellent internal consistency, Cronbach's alpha 0.95 (95% CI 0.93-0.96). Likewise, the Arabic BADLS had strong convergent validity with the MoCA ($r = -0.82$, $p < 0.001$).

Conclusions:

The Arabic BADLS is a reliable scale that can be used to assess the functional performance of people living with dementia.

Keywords: Dementia, Bristol Activities of Daily Living Scale, scale validation, reliability

Abbreviations:

Abstract word count: 146

Word count: 2819

Running Title: The Arabic BADLS

Introduction

The World Health Organization (WHO) considers dementia as one of the major causes of disability affecting elderly.(1) Twelve percent of the years lived with disability in adults are thought to be caused by dementia.(1) The prevalence of dementia increases with age, such that dementia affects 4.7% of people older than 65 years living in high-income countries. Albeit there is limited information on the burden and prevalence of dementia in the Arab world, with estimates of 2.6- 6% of older adults living in the Arab region having dementia (2-6), a recent report suggested prevalence could reach as high as 18.5% in the oldest age groups.(2) The cost of caring for dementia globally is estimated to surpass one trillion US dollars with the greatest impact on high-income countries.(7, 8) Early diagnosis of dementia is cost-effective in enabling earlier provision of treatment of behavioral symptoms, education of caregivers and, thus, prevention of institutionalization.(9)

Accurate diagnosis of dementia requires a detailed assessment of the patient's current and previous functional performance. (10, 11) Functional measures of daily living are essential components of the comprehensive assessment of and management of patients with cognitive decline, and it is crucial that the measures used are relevant to the patient being assessed.(12) For example, the Barthel Activity of Daily Living Index was originally validated in patients with

stroke,(13) thereby limiting its utility in patients with dementia given the different patterns of disability between the two groups.(14) On the other hand, the Bristol Activity of Daily Living Scale (BADLS) was designed and validated for use in patients with dementia.(15) The scale developers sought input from caregivers of patients diagnosed with dementia when undergoing initial scale development.(15)

There are few Arabic language scales for patients with dementia. Several studies have attempted to translate and validate cognitive and functional assessment and screening tools to the Arabic language. One example is the recent Arabic validation of the Katz Activity of Daily Living Index.(16) Katz ADL scores are strongly associated with MMSE scores ($r = 0.7$) and with Clinical Dementia Rating scale scores ($r = -0.8$).(17-19) However, the scale by Katz et al. assesses basic activities of daily living, which only become impaired in advanced stages of dementia.(18, 19), reducing the usefulness of the scale for assessing dementia in the early stages, or for detecting early signs of functional decline.

The original BADLS was developed for English-speaking people residing in western countries,(15) therefore, possibly introducing bias if used to assess patients with different language or culture without proper translation and validation. Given the importance of psychometrically sound scales in the Arabic language to assess the functional performance of Arabic people with dementia (20), we aimed to translate, cross-culturally adapt, and validate the BADLS to the Arabic language for people with neurocognitive decline and dementia.

Methods

Design and Participants

We performed a cross-sectional study that included caregivers of adults who were aged more than 40 years during the period from January 2020 to April 2021. The total sample of participants were 139 participants; 69 caregivers, and their 69 community dwelling individuals diagnosed either with major neurocognitive disorder (dementia), or mild neurocognitive disorder per DSM-5 criteria, or had normal cognitive function. Participants were excluded if they were not accompanied by a caregiver or informant who was willing to participate in the study.

Ethics approval

We collected all the data anonymously after receiving approval from King Saud University institutional review board with reference number IRB number 20/0115/IRB project number E-19-4418 and Informed consent was given verbally as required by our institutional review board's policies.

Scale validation

Permission was granted from the original first author to translate the BADLS into modern standard Arabic. We first translated the original BADLS scale to the Arabic language. The scale consists of 20 items, responses are graded to describe the person's increasing dependency in performing basic and instrumental activities of daily living. The items assess the following daily

activities: drink preparation, use of the telephone, food preparation, housework, communication, shopping, eating, orientation to space, games and hobbies, dental care, hygiene, bathing, dressing, using the toilet, drinking, mobility, transferring, orientation to time, driving, using public, transport, and managing finances. Each item is scored 0 (independent) to 3 (fully dependent), with the total score ranging from 0 to a maximum score of 60. The Cronbach's alpha reliability coefficient of the original total scale was 0.82 indicating good reliability. The BADLS scale has a moderate convergent validity ($r = 0.65$) against the participant's actual function at home as rated by a nurse.(12) Additionally, the BADLS scale is strongly associated ($r = -0.67$) with the commonly used screening cognitive test, the Mini-Mental State Examination (MMSE).(12)(15)

Forward translations to Arabic were completed by two individuals fluent in both Arabic and English with qualifications in internal medicine and geriatrics.(21, 22) The two translations were revised and merged to a single form. Differences in translation were resolved by consulting with experts in Arabic language from Ain Shams University, Cairo, Egypt, and King Saud University Riyadh, Saudi Arabia. Back translation was completed by a professional academic translation officer with no knowledge of the original scale. The back translated scale was assessed for face validity by five experts (methodology, geriatrics), which included comparing the back-translated scale with the original English version. The second round of face validity was assessed by pilot testing with a sample of 59 community dwelling caregivers aged 27-67 years, from Saudi Arabia, Kuwait, Egypt, Sudan, and Algeria. The participants scored each item for clarity on a scale from 1-10 and were asked to provide feedback on the items if they were not clear. According to the

received feedback, four items were judged as ambiguous and were revised by the panel, which included the original first author of the BADLS.

All items were discussed, and consensus was achieved. The ambiguous items were modified to ensure cultural adaptation without unduly altering the original scale meanings (see Appendix Table 4A). In the “Eating food” item, the option “Eats appropriately using correct cutlery” was modified to include eating with the hand because eating with one hand is a very common practice in Arabic culture. In the English version, using fingers to eat food is evidence of significant decline in ability, and is scored 2 points. Clearly, this would not be appropriate in Arabic culture. The option “Uses fingers to eat food” was modified in the Arabic version. “Drinks appropriately with aids, beaker/straw etc” and “Does not drink appropriately even with aids but attempts” were modified by adding examples that are easily understood in Arabic culture. For the “hygiene” item the option ‘Washes regularly and independently’ was modified by specifying hands and face because the translation of “washing” to Arabic could be understood as bathing. In the “finances” item, the option ‘unable to write cheque but can sign name and recognizes money values’ was updated by excluding “writing a cheque” which is seldom practiced in Arabic society since the introduction of ATM cards and online finance management worldwide, replacing it with an equivalent statement “recognize money value and can buy things”. (See Appendix Table 4A.)

Sampling, recruitment, and study procedures

Participants were recruited from primary care clinics, geriatric medicine clinics and neurology clinics at four sites: 1) King Saud University Medical City (KSUMC), Riyadh, Saudi Arabia, 2) Dr. Sulaiman Al Habib Medical Group (HMG), Al Takhassusi hospital, Riyadh, Saudi Arabia, 3) King Fahad Specialist Hospital, department of medicine, neurology division, Dammam, Saudi Arabia, 4) private outpatient clinic, Cairo, Egypt. Participants and their caregivers gave informed consent during the initial visit to participate in the study. Data are reported from 69 caregivers of 54 individuals with cognitive impairments, and 15 individuals without. Caregivers completed the 20-item paper-based Arabic-BADLS, and the paper-based Arabic-Katz ADL for concurrent validity, and a trained physician or psychologist completed the Montreal Cognitive Assessment (MoCA)(23)with participants for convergent validity testing. In addition, we obtained basic demographic data for the individual on age, sex, and educational level.

The Katz Index of Independence in Activities of Daily Living, commonly referred to as the Katz ADL Index, was used to assess the individual's ability to perform activities of daily living independently for those who are community dwelling or requiring care at a health facility. The test ranks adequacy of performance in the six functions of bathing, dressing, toileting, transferring, continence, and feeding. Individual items are scored "yes" or "no" for independence in each of the six functions. A score of 6 indicates full function, 4 indicates moderate impairment, and 2 or less indicates severe functional impairment.(17, 18) Thus, higher total scores indicate greater independence.

The Montreal Cognitive Assessment scale (MoCA) is a commonly used screening tool used to detect cognitive impairment.(23) The MoCA consists of eight cognitive domains: attention and

concentration, executive functions, memory, language, visuo-constructional skills, conceptual thinking, calculations, and orientation. A score below 26 out of 30 is associated with presence of cognitive impairment.(23, 24)

Outcomes

The primary outcome was the reliability coefficient Cronbach's alpha, and concurrent and convergent validity with the Katz-ADL and MoCA scales, respectively. The secondary outcome was the impact of age, sex, and educational level on BADLS score.

Statistical analysis

We reported mean, standard deviation(SD), and corrected item-total correlation for each of the three scales (i.e., Arabic BADLS, Arabic Katz ADL, MoCA). We report the Cronbach's alpha and 95% confidence intervals to determine the internal consistency of scores obtained for the three scales. Additionally, we report Pearson correlation of total scores to assess concurrent and convergent validity between the Arabic BADLS, Arabic Katz ADL, and MoCA. Construct validity was determined through univariate linear regression on total scale scores of the following: age, sex (male = 0, female = 1), educational level (illiterate, over 4 years education, primary school, intermediate school, high school, College/technical and, Postgraduate education, scored (0- 6). We hypothesized that older individuals and those with lower educational level would attain higher dependency scores. All analyses were conducted using Stata/SE 16.1 software for Mac.

Results

The Arabic BADLS assessment was completed by the participant's primary caregiver for a total of 69 individuals; 94% of participants were recruited from the outpatient setting in Saudi Arabia and Egypt. The median age of the patients was 77 years (IQR 68, 82), with 21.7% less than 65 years, and 32(46.4%) were male (Table 1). The study participants had diverse educational background, forty-five percent of the participants were either illiterate or received 4 years of education which is typical of older people in Arabic countries. Around 67% of the female participants were illiterate or received 4 years of education. Whilst around 33% were college or college equivalent graduates, most of those these were male (70%) and they tended to be younger with mean age of 58 years. More than half (52.2%) of the caregiver informants completing the assessments were the participant's daughter 36(52.2%).

The mean total score for the BADLS was 21.5 ± 17.7 , ranging from 0-56. The Arabic BADLS had excellent internal consistency, Cronbach's alpha 0.95 (95% CI 0.93-0.96) and the corrected item total correlations for the BADLS items were all > 0.48 (Table 2).

Confirming concurrent validity, the Arabic BADLS was significantly and negatively correlated with the Arabic Katz ADL. Likewise, the Arabic BADLS also had strong convergent validity with the MoCA (see Table 3) indicating that those with better cognition were more independent in their ADL function. Also as expected, older patients and those with less education were more dependent on the Arabic BADLS, with women also being more dependent, especially when

older. In univariate regression analysis, the BADLS score increased by 2.7 points for every 5-year increase in age above 65 years, and by 8.2 for females, and decreased by 16.1 for individuals with more than 6 years of education (Table 4). In our sample, younger age and male sex were associated with higher education attainment and tested positive for collinearity. The multivariable model for BADLS score adjusted for age and sex showed increased dependency scores by 8.7 points only for females when adjusted for age more than 65 years. The model explained 33% of variability in the data (Table 5.).

Moreover, sex differences were apparent in terms of item endorsement on the BADLS scale (Table 6.). Males were more likely to endorse the “not applicable” option for the “food preparation”, “housework”, and “drink preparation” items. On the other hand, females were more likely to endorse the “not applicable” option for the “transportation” and “games and hobbies” items.

Discussion

This study is the first to translate and cross-culturally adapt the original BADLS to the Arabic language in individuals with varying degrees of cognitive function or dementia. The translated scale demonstrated excellent internal consistency. Despite making changes to some items to make them more culturally appropriate, all items, whether culturally modified or not, had strong item-total correlations suggesting they were still tapping into the same underlying construct. There was also evidence of excellent validity, supported by strong correlations with the Katz ADL, MoCA and age, implying that the Arabic BALDS is likely able to discriminate between dementia disorders of different severity.

In contrast with the original BADLS (15), the scores of the Arabic BADLS were associated with sex and education, as demonstrated in the higher dependency scores for females over 65. This interesting demographic observation is likely related to the government not mandating education for women until the mid 1970s.

All the four culturally modified items had good face validity; these modifications were necessary to accommodate for modern changes to modern life (around finances) and to what is considered normal for Arabic culture. Arabic speaking countries are mostly developing countries with rich cultural and traditional characteristics that vary significantly from western countries.(2, 25-27) For example, people growing up or living in Saudi Arabia or Egypt still traditionally use their hand when eating instead of using utensils.(28) In contrast, eating by hand is considered a decline in function for people living in western countries, this is clearly reflected in the original scoring of the BADLS.(15) Another example of an important difference is the process of self-hygiene.(29, 30) Most of the bathrooms in traditional homes do not utilize bathtubs, rather, bathing buckets or showers are more common.(30, 31) The act of bathing in a bathtub was not commonly practiced by previous generations before modern homes were built.(30, 31) All these items were adapted in the Arabic BADLS to reflect cultural aspects of these common activities of daily living for people originating from Arabic speaking countries.

The high frequency of “not-applicable” responses to food or drink preparation and housework, particularly for men is worth noting. This clearly contrasts with the original development of the BADLS where less frequent “not applicable” response options were chosen.(15) One explanation

is cultural gender roles in Arabian societies, with very few females engaging in the work force during their youth in the preceding generations, devoting their time completely to household duties such as meal preparation and housework activities, whereas men used transportation more frequently for work and income generation.(32) Likewise, the great majority of primary caregivers who completed the questionnaires were the participants' children, and in two thirds of the cases this child was the daughter. Certain cultural and religious values in society encourages providing continuous care for elders at home, with an automatic transfer of responsibilities to younger individuals in the family, thereby relieving elderly individuals early on from performing many responsibilities they would be normally doing had they been living in an environment with less family support.(32, 33)

Functional assessment scales are essential when assessing patients with dementia and cognitive impairment in the clinic. Hence, there is a huge potential for using the BADLS in this population, especially considering that it has already demonstrated an ability to track changes over time, including being sensitive to response to treatment(34). Given the emergence of novel therapies in treating Alzheimer's disease, we hope the Arabic BADLS will be a useful tool in monitoring response to therapy.(35) The scale will be similarly valuable in allowing for early recognition of dementia or cognitive impairments.

Our study has several strengths: the translation process was rigorous, and we elicited feedback from patients coming from various Arab countries. In addition, we performed regression analysis to help inform policymakers in tracking the changes in BADLS score while planning for preventative strategies and screening programs for dementia. However, we were not able to

perform confirmatory factor analysis because of the small sample size. Also, the psychometric properties of the scale might change over time because of the rapid changes in the literacy level in Saudi Arabia. In our sample, the literacy level was lower than the previously reported 50% in those over 65 years of age or older.(36)

Conclusion

In conclusion, the distinction between mild and major neurocognitive disorders (dementia) depends on a thorough assessment of the individual's previous and current functional performance. Monitoring the progression of dementia across the different stages requires periodic assessment of the patient's cognitive and functional performance using validated and sensitive functional measures of the activities of daily living. The Arabic BADLS is a reliable scale that can be used to assess the functional performance of people living with dementia.

Contributions

Conceived and designed the study: WA, RA, AS, RSB

Translated and back translated the BADLS: WA, AS

Reviewing the back translation: WA, RA, AS, TM, RK, RSB

Collected the data: WA, RK, TM, AS

Performed the data analysis: RA, WA

Wrote the manuscript: WA, RA, AS, TM, RK, RSB

All authors contributed to, reviewed, and approved the final draft of the paper.

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Competing Interest:

All Authors have no competing interest to disclose.

Patient consent for publication

Not required.

Ethics committee approval

Human Research Ethics Committee approval was provided by the King Saud University Institutional Review Board, 20/0115/IRB project number E-19-4418 and all participants gave informed consent verbally, as required by our institutional review board's policies. Data were anonymized before secured storage.

Data availability statement:

Data are available upon reasonable request to the corresponding author

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Tables:

Table 1. Baseline characteristics

Table 1. Baseline characteristics		
Age, years	Median (IQR)	77 (68, 82)
Gender	Male	32 (46.4)
MoCA	Median (IQR)	11 (5, 23)
Katz ADL Scale	Median (IQR)	4 (2, 6)
BADLS	Median (IQR)	19 (3, 40)

Diagnosis		
	No dementia	15 (21.7)
	Mild cognitive impairment	16 (23.2)
	Dementia	38 (55.1)
Informant	Daughter	36 (52.2)
	Husband	2 (2.9)
	Mother	2 (2.9)
	Sister	1 (1.5)
	Son	26 (36.7)
	Wife	2 (2.9)
Education level	Illiterate	16 (23.2)
	Literate / > 4year education	15 (21.7)
	primary school	3 (4.4)
	intermediate school	3 (4.4)
	high school	9 (13.0)
	College/technical	19 (27.5)
	Postgraduate	4 (5.8)
Note. All values are N (%) expect when indicated		

Table 2. BADLS Item- total statistics

Table 2. Item- total statistics				
Item	Mean	SD	Item-total correlation	Alpha if item deleted
Food preparation	0.94	1.31	0.50	0.95
Eating	0.65	1.01	0.71	0.95
Drink preparation	1.15	1.41	0.71	0.95
Drinking	0.36	0.92	0.56	0.95
Dressing	1.10	1.15	0.82	0.94
Hygiene	1.10	1.25	0.90	0.94
Teeth	0.98	1.25	0.78	0.95
Bathing	1.37	1.35	0.84	0.94
Toilet/commode	0.85	1.12	0.79	0.95
Transfer	1.13	1.21	0.84	0.94
Mobility	1.23	1.17	0.74	0.95
Orientation to time	1.10	1.13	0.75	0.95
Orientation to space	0.84	1.06	0.71	0.95
Communication	0.78	0.99	0.78	0.95
Telephone	1.23	1.18	0.80	0.94

Housework	1.13	1.36	0.58	0.95
Shopping	1.53	1.30	0.71	0.95
Finances	1.43	1.37	0.82	0.94
Games & hobbies	1.11	1.35	0.48	0.95
Transportation	1.40	1.30	0.74	0.95

Table 3. Correlation matrix

Table 3. Correlation matrix			
	Total Arabic BADLS	Total Arabic Katz ADL	Total MoCA
Total katz ADL	-0.86 ‡		
Total MoCA	-0.82 ‡	0.74 ‡	
Age	0.52 ‡	-0.51 ‡	-0.62 ‡

Note. ‡ $p < .001$, † $p < .01$, * $p < .05$

Table 4. Univariate regression

Table 4. Univariate regressions analyses for the dependant variable BADLS score					
	B	Standard Error	P- value	95% CI	R²
Every 5 years increase in age >65	2.72	0.54	< .001	1.6, 3.8	0.27

Sex, female	8.23	4.20	0.05	-0.2, 16.6	0.05
> 6 years of education	-16.10	3.84	< .001	-23.8, -8.4	0.20
R² Proportion of heterogeneity explained by the model					

Table 5. Multivariate regression

Table 5. Multivariate regression analyses for the dependant variable BADLS score				
	B	Standard Error	P- value	95% CI
Every 5 years increase in age >65	2.75	0.52	< .001	1.70, 3.81
Sex, female	8.73	3.56	.017	1.62, 15.86
constant	12.79	2.73	<.001	7.33, 18.25

Table 6. Frequency of use of ‘not applicable’ item on the BADLS

Table 6. Frequency of use of ‘not applicable’ item on the BADLS				
Item	N	%	male	female, N
Food preparation	30	43.5	23	7
Eating	1	1.4	1	0
Drink preparation	16	23.2	13	3
Drinking	0	-	-	-

Dressing	1	1.4	0	1
Hygiene	0	-	-	-
Teeth	8	11.6	4	4
Bathing	0	-	-	-
Toilet/commode	1	1.4	0	1
Transfer	1	1.4	1	0
Mobility	0	-	-	-
Orientation to time	1	1.4	1	0
Orientation to space	4	5.7	1	3
Communication	1	1.4	1	0
Telephone	0	-	-	-
Housework	26	37.7	17	9
Shopping	10	14.5	6	4
Finances	2	2.8	1	1
Games & hobbies	23	33.3	8	15
Transportation	14	20.3	3	11

Appendix:

Table 1A. Score distribution

Table 1. Score distribution

	BADLS			Katz ADL			MOCA		
Percentile	Centile	95% Conf. Interval		Centile	95% Conf. Interval		Centile	95% Conf. Interval	
5	0	0	0	0	0	.5	0.35	0	2
10	0	0	0.69	0.5	0	1.5	1	0	4
25	2.5	0	11	2	1	3	5	2	9.97
50	19	11.		4	3	5	11	8.57	19
75	40	32.		6	5	6	23.5	18.03	26
90	45	41.		6	6	6	26.3	25	29.57
95	49.5	45	56.00*	6	6	6	28.65	26	30
mean	21.5(17.7)			3.7(2.1)			13.7(9.7)		
median	19(3, 40)			4(2,6)			11(5,23)		
skewness	0.2			-0.42			0.14		
min	0			0			0		
max	56			6			30		

Table 2A. Item- total statistics for the MOCA

Table 2. Item- total statistics for the MOCA		
Item	item-test correlation	Alpha if item deleted
Alternating sequence	0.76	0.93

Cube copying	0.60	0.93
Clock drawing	0.85	0.93
Naming	0.80	0.93
Forward digit span	0.82	0.93
Backward digit span	0.83	0.93
Vigilance A	0.68	0.93
Subtraction serial 7	0.91	0.93
Sentence repetition	0.71	0.93
Sentence repetition	0.73	0.93
Verbal fluency	0.56	0.93
Abstraction	0.66	0.93
Abstraction	0.80	0.93
Delayed recall	0.84	0.94
Orientation to date	0.78	0.93
Orientation to month	0.69	0.93
Orientation to year	0.83	0.93
Orientation to day	0.79	0.93
Orientation to place	0.60	0.93
Orientation to city	0.61	0.93

Table 3A. Item- total statistics for the Katz ADL

Table 3. Item- total statistics for the Katz ADL

Item	item-test correlation	Alpha if item deleted
Bathing	0.91	0.92
Dressing	0.91	0.92
Toileting	0.94	0.91
Transferring	0.82	0.93
Continence	0.81	0.94
Feeding	0.87	0.93

Table 4A. The original BADLS with Arabic translation and back translation from Arabic

مقياس بريستول للأنشطة اليومية (النسخة العربية)

Bristol Activities of Daily Living Scale

ر . بكس وآخرون 1996

Original English instructions	translated from -Back Arabic	Arabic اللغة العربية
<p>This questionnaire is designed to reveal the everyday ability of people who have memory difficulties of one form or another.</p> <p>For each activity (No. 1 - 20), statements a - e refer to a different level of ability.</p> <p>Thinking of the last 2 weeks, tick the box that represents your relative's/friend's AVERAGE ability. (If in doubt about which box to tick, choose the level of ability which represents their</p>	<p>This questionnaire is designed to reveal the daily capabilities of people who suffer from memory difficulties in one way or another.</p> <p>Choose the box (for each of the questions below) representing the capabilities of your relative/friend in the period of the last two weeks for each activity (from 1-20). If in doubt, just choose the level of</p>	<p>هذا الاستبيان مصمم للكشف عن القدرة اليومية للأشخاص ممن يعانون من صعوبات في الذاكرة بشكل أو بآخر. في الأنشطة من 1 إلى 20 تشير العبارات (أ - هـ) إلى مستويات قدرات مختلفة.</p> <p>إختر المربع (لكل سؤال بالأسفل) الذي يمثل متوسط قدرات قريبك/صديقك في خلال الأسبوعين الأخيرين. لكل الأنشطة (من 1-20) إذا كنت في شك، فقم باختيار مستوى القدرة الذي يمثل متوسط أداء الأنشطة على مدار آخر أسبوعين.</p>

<p><i>average</i> performance over the last 2 Weeks. Tick ‘Not applicable’ if your relative never did that activity when they were well).</p>	<p>capacity that represent the average performance of activities across the last two weeks</p> <p>Choose “Not applicable” if your relative has never done such activity, even when he was not sick</p>	<p>إختار "لا ينطبق" إذا لم يقم قريبك بهذا النشاط أبدًا حتى عندما كان سليمًا.</p>
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Original English items	Back-translation from Arabic	اللغة العربية Arabic		
Selects and prepares food as required	Choose and prepare food (properly/as it should be)	أ) يختار ويعد الطعام كما ينبغي	a	
Able to prepare food if ingredients set out	Can prepare food if its ingredients are provided	ب) يستطيع ان يعد الطعام إذا خُضرت مكوناته	b	1-إعداد الطعام PREPARING FOOD
Can prepare food if prompted step by step	Can prepare food if someone	ج) يستطيع ان يعدّ الطعام إذا حفزه شخص خطوة بخطوة	c	

	(encourages/motivates) him step by step			
Unable to prepare food even with prompting and supervision	Cannot prepare food even after (motivation/encouragement) and supervision	(د) لا يستطيع ان يعدّ الطعام حتى بعد التحفيز والإشراف عليه	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Eats appropriately using correct cutlery	Can eat using the correct (tools/utensils) or eat with his hand as his usual/habit	(أ) يستطيع ان يأكل باستخدام الأدوات الصحيحة أو يأكل بيده كعادته	a	2-تناول الأكل EATING
Eats appropriately if food made manageable and /or uses spoon	Eats appropriately if the food is (prepared/made) in a way easy to eat (like cutting bread)	(ب) يأكل بشكل مناسب إذا هئى الأكل بطريقة تسهل تناوله (مثل تقطيع الخبز)	b	
Uses fingers to eat food	Eats by using his fingers in a primitive way that is not his usual	(ج) يأكل باستخدام الأصابع بطريقة بدائية بخلاف العادة	c	
Needs to be fed	Needs to be fed.	(د) يحتاج لمن يناوله الأكل	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Selects and prepares drinks as required	Chooses and prepares drinks appropriately	(أ) يختار ويعد المشروبات كما ينبغي	a	

Can prepare drinks if ingredients left available	Can prepare drinks if its ingredients are provided	(ب) يستطيع أن يُعدّ المشروبات إذا هُيئت له المكونات	b	DRINK
Can prepare drinks if prompted step by step	Can prepare drinks if someone (encourages/motivates) him step by step	(ج) يستطيع أن يُعدّ المشروبات إذا حفزه شخص خطوة بخطوة	c	
Unable to make a drink even with prompting and supervision	Cannot prepare drinks even after (motivation/encouragement) and supervision	(د) لا يستطيع أن يُعدّ المشروبات حتى بعد التحفيز والإشراف عليه	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Drinks appropriately	Can drink like a normal person	(أ) يستطيع الشرب كشخص عادي	a	
Drinks appropriately with aids, beaker/straw etc.	(Able to/Can) drink, except by using (aiding/assisting) (utensils/tools) like a straw.	(ب) يستطيع الشرب لكن باستخدام أدوات مساعدة مثل المصاص	b	4-تناول المشروبات DRINKING
Does not drink appropriately even with aids but attempts to	Cannot drink using (aiding/assisting) (utensils/tools) (like covered child's cup) but tries.	(ج) لا يستطيع الشرب باستخدام أدوات مساعدة (مثل كوب مغطى للأطفال) ولكنه يحاول	c	

Has to have drinks administered (fed)	(Someone/A person) has to help with drinking	(د) يجب أن يساعده شخص ما في تناول المشروبات	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Selects appropriate clothing and dresses self	Can choose the appropriate clothes and wear it himself	(أ) يختار الملابس المناسبة ويلبسها بنفسه	a	5-لبس الملابس DRESSING
Puts clothes on in wrong order and /or back to front and /or dirty clothing	Wears clothes but in incorrect order, inside-out or dirty clothes	(ب) يرتدي ملابسه لكن بترتيب خاطئ أو مقلوبة أو ملابس متسخة	b	
Unable to dress self but moves limbs to assist	Cannot wear his clothes himself but moves his limbs to help.	(ج) لا يستطيع لبس ملابسه بنفسه ولكن يحرك أطرافه للمساعدة	c	
Unable to assist and requires total dressing	Does not help in wearing his clothes and must be completely helped to wear clothes	(د) لا يساعد في لبس ملابسه ويجب مساعدته في لبس الملابس بالكامل	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Washes regularly and independently	Washes his hands and face regularly and independently	(أ) يغسل يديه ووجهه بانتظام وبشكل مستقل	a	6-النظافة الشخصية HYGIENE
Can wash self if given soap, flannel, towel, etc.	Able to wash if soap or a towel is provided for him	(ب) قادر على الغسيل إذا وفر له الصابون أو المنشفة	b	

Can wash self if prompted and supervised	Able to wash after (motivation/encouragement) and (supervision/supervising him)	(ج) قادر على الغسيل بعد التحفيز والإشراف عليه	c
Unable to wash self and needs full assistance	Not able to wash by himself and needs complete help	(د) غير قادر الغسيل وحده ويحتاج مساعدته بالكامل	d
Not applicable	Not applicable	(هـ) لا ينطبق	e

Cleans own teeth/dentures regularly and independently	(Cleans/brushes) teeth / dentures regularly and independently	(أ) ينظف الأسنان / طقم الأسنان بانتظام وبشكل مستقل	a	7-الأسنان TEETH
Cleans teeth/dentures if given appropriate items	(Cleans/brushes) teeth / dentures regularly if (tools/instruments/utensils/items) are brought to him	(ب) ينظف الأسنان / طقم الأسنان بانتظام إذا أحضرت له الأدوات	b	
Requires some assistance, toothpaste on brush, brush to mouth etc	Needs some help like placing toothpaste on the brush or the brush into the mouth.	(ج) يحتاج بعض المساعدة مثل وضع المعجون على الفرشاة أو الفرشاة في الفم	c	
Full assistance given	Needs complete help in (cleaning/brushing) his teeth	(د) يحتاج مساعدة كاملة في تنظيف أسنانه	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Bathes regularly and independently	Bathes completely regularly and independently	(أ) يستحم بالكامل بانتظام وبشكل مستقل	a	8-الاستحمام /الاعتسال BATH/SHOWER
Needs bath to be drawn/shower turned on but washes independently	Needs help in preparing the bathtub / the water but washes by himself	(ب) يحتاج مساعدة بتجهيز حوض الاستحمام/المياه لكن يغتسل وحده	b	

Needs supervision and prompting to wash	Needs supervision and motivation to wash	(ج) يحتاج إشراف وتحفيز كي يغتسل	c	
Totally dependent, needs full assistance	Dependent on other completely (completely dependent on others) and needs complete help	(د) معتمد على الآخرين بشكل كامل ويحتاج مساعدة كاملة	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Uses toilet appropriately when required	Uses the (washroom/bathroom) correctly and when needed	(أ) يستخدم دورة المياه بشكل صحيح وعند الحاجة	a	9-دورة المياه TOILET/ COMMODE
Needs to be taken to the toilet and given assistance	Needs help in going to the BR/WR and some (other/additional) help	(ب) يحتاج المساعدة في الذهاب لدورة المياه وبعض المساعدة الأخرى	b	
Incontinent of urine or faeces	Cannot control either urine or stool	(ج) لا يتحكم في واحد من البول أو البراز	c	
Incontinent of urine and faeces	Cannot control both urine and stool	(د) لا يتحكم في البول ولا في البراز معا	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	

Can get in/out of chair unaided	Able to sit and (get up/stand) from a chair without (help/assistance)	(أ) يستطيع الجلوس والنهوض من الكرسي بدون مساعدة	a	10-التنقل TRANSFERS
Can get into a chair but needs help to get out	Can sit without help but needs help to get up	(ب) يستطيع الجلوس بدون مساعدة ولكن يحتاج مساعدة في النهوض	b	
Needs help getting in and out of a chair	Needs help to sit and to (get up/stand) from a chair	(ج) يحتاج مساعدة في الجلوس والنهوض من الكرسي	c	
Totally dependent on being put into and lifted from chair	Completely dependent on others in sitting and getting up from a chair	(د) يعتمد كلياً على الآخرين بالجلوس والنهوض من الكرسي	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Walks independently	Able to walk independently	(أ) يستطيع المشي باستقلالية وبدون مساعدة	a	11-الحركة MOBILITY
Walks with assistance i.e., furniture, arm for support	Able to walk but with help (like/for example) with support and leaning on furniture other peoples' arms	(ب) يستطيع المشي لكن بمساعدة مثلاً بمساندة والانتكاء على الأثاث أو ذراع الآخرين	b	
Uses aids to mobilize i.e., frame, sticks etc.	Moves with help from assist devices like a walker or cane	(ج) يتحرك بمساعدة أدوات مساعدة مثل المشاية أو العكاز	c	

Unable to walk	Cannot walk	(د) لا يستطيع المشي	d	12-إدراك الوقت ORIENTATION- TIME
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Fully orientated to time/day/date etc.	(Realizes/knows) time, the day, and date completely	(أ) يدرك الوقت واليوم والتاريخ بشكل كامل	a	
Unaware of time/day etc but seems unconcerned	Does not know the time and day but doesn't care	(ب) غير مدرك للوقت واليوم، ولكنه غير مهتم	b	
Repeatedly asks the time/day/date	Asks a lot about the time, day and date.	(ج) يسأل كثيراً عن الوقت واليوم والتاريخ	c	
Mixes up night and day	Confuses between daytime and nighttime	(د) يخلط بين الليل والنهار	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	

Fully orientated to surroundings	Knows his location completely like his current address	أ) يدرك مكانه بشكل كامل مثل عنوان تواجدہ الحالي	a	13- إدراك المكان ORIENTATION - SPACE
Orientated to familiar surroundings only	Knows his surrounding locations only if it is familiar to him	ب) يدرك الأماكن المحيطة به إذا كانت مألوفاً فقط	b	
Gets lost in home, needs reminding where bathroom is, etc.	Gets lost inside the house and needs to be reminded where the BR and other places are.	ج) يتوه داخل المنزل ويحتاج تذكير بمكان دورة المياه وغيرها	c	
Does not recognize home as own and attempts to leave	Cannot recognize his house and tries to leave it	د) لا يستطيع تمييز منزله ويحاول المغادرة خارجه	d	
Not applicable	Not applicable	هـ) لا ينطبق	e	
Able to hold appropriate conversation	Able to have a correct conversation (converse correctly/coherently/meaningful conversation)	أ) يستطيع إجراء محادثة بشكل صحيح	a	

Shows understanding and attempts to respond verbally with gestures	Appears to understand speaker and tries to reply with nodding	(ب) يظهر فهم المتحدث ويحاول الرد بكلام مع إيماءات	b	
Can make self-understood but difficulty understanding others	Able to express to others what he means to say , but understands others with difficulty	(ج) يستطيع إفهام الآخرين مغزاه ولكن يفهم الآخرين بصعوبة	c	
Does not respond to, or communicate with others	Does not (respond/reply) or communicate with others	(د) لا يستجيب ولا يتواصل مع غيره	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Uses telephone appropriately, including obtaining correct number	Uses the phone appropriately and can (find/locate) numbers from the phone directory appropriately	(أ) يستخدم الهاتف بشكل صحيح للاتصال بدون مساعده	a	15-الهاتف TELEPHONE
Uses telephone if number given verbally/visually or predialed	Uses the phone if number is given to him verbally/written or	(ب) يستخدم الهاتف بشكل صحيح للاتصال إذا تمت مساعده	b	

	dialed on the phone			
Answers telephone but does not make calls	Answers the phone but cannot use it to make calls	ج) يمكنه الرد على الهاتف ولكن لا يستطيع الاتصال حتى اذا تمت مساعدته	c	
Unable/unwilling to use telephone at all	Cannot or does not (want) to use the phone at all	د) لا يستطيع استخدام الهاتف مطلقا	d	
Not applicable	Not applicable	هـ) لا ينطبق	e	
Able to do housework/gardening to previous standard	Able to do house and garden (work/chores) at his previous level	أ) يستطيع القيام بأعمال المنزل والحديقة كمستواه السابق	a	16- أعمال المنزل / الحديقة HOUSEWORK / GARDENING
Able to do housework/gardening but not to previous standard	Able to do house and garden (work/chores) but not at his previous level	ب) يستطيع القيام بأعمال المنزل والحديقة ولكن ليس كمستواه السابق	b	
Limited participation with a lot of supervision	Participates (slightly/partially) and under lots of supervision (major supervision)	ج) يشارك بشكل بسيط وتحت إشراف كبير	c	

Unwilling/unable to participate in previous activities	Cannot or does not want to participate in previous usual activities	(د) لا يستطيع أو لا يريد المشاركة في أنشطته المعتادة سابقاً	d	<p style="text-align: center;">17-التسوق SHOPPING</p>
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Shops to previous standard	Shops at his previous level	(أ) يتسوق كمستواه السابق	a	
Only able to shop for 1 or 2 items with or without a list	Can buy one or two (things/items) with our without a shopping list	(ب) يستطيع شراء شيء واحد أو إثنين مع/ بدون قائمة تسوق	b	
Unable to shop alone, but participates when accompanied	Cannot shop on his own but (participates/helps) in shopping if he is with a companion	(ج) لا يستطيع التسوق وحده ولكن يشارك في التسوق إذا كان معه مرافق	c	
Unable to participate in shopping even when accompanied	Does not participate in shopping even in the presence of a companion	(د) لا يشارك في التسوق حتى بوجود مرافق	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Responsible for own finances at previous level	Responsible for his financial	(أ) مسؤول عن متعلقاته المالية كمستواه السابق	a	<p style="text-align: center;">18-إدارة المتعلقات المالية FINANCES</p>

	obligations at his previous level			
Unable to write cheque. Can sign name & recognises money values	Cannot write a cheque but can sign his name and (discriminate/differentiate/recognize) the value of money	(ب) لا يستطيع إدارة متعلقاته المالية ولكنه يميز قيمة المال وقادر على إتمام عملية شراء	b	
Can sign name but unable to recognise money values	Can sign his name but cannot (differentiate/recognize) the value of money (or how much the money is worth)	(ج) يصرف المال، ولكن لا يميز قيمة المال	c	
Unable to sign name or recognise money values	Cannot sign his name nor differentiate value of money.	(د) معتمد بشكل كلي على الآخرين	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Participates in pastimes/activities to previous standard	Participates in games and activities same as his previous level	(أ) يشارك بالألعاب والأنشطة كمستواه السابق	a	19-الألعاب /الهوايات GAMES HOBBIES/

Participates but needs instruction/supervision	Participates but requires instructions or supervision	(ب) يشارك لكن يحتاج تعليمات أو إشراف	b	
Reluctant to join in, very slow needs coaxing	Hesitates in participating, participates slowly and needs convincing	(ج) يتردد في المشاركة ويشارك ببطء ويحتاج لإقناع	c	
No longer able or willing to join in	Cannot or does not participate in doing any hobby	(د) لا يستطيع أو لا يشارك في القيام بأي هواية	d	
Not applicable	Not applicable	(هـ) لا ينطبق	e	
Able to drive, cycle or use public transport independently	Can drive a car or a bike or use public transportation independently	(أ) يستطيع قيادة السيارة أو الدراجة أو المواصلات العامة مستقلاً	a	
Unable to drive but uses public transport or bike etc.	Cannot drive a car but uses public transportation or a bike	(ب) لا يستطيع قيادة السيارة، ولكن يستخدم المواصلات العامة أو الدراجة	b	20-المواصلات TRANSPORT
Unable to use public transport alone	Cannot use public transportation by	(ج) لا يستطيع استخدام المواصلات العامة وحده	c	

	himself (independently)			
Unable/unwilling to use transport even when accompanied	Cannot / does not want to use transportation even if with a companion	د) لا يستطيع/لا يريد استخدام المواصلات حتى مع مرافق	d	
Not applicable	Not applicable	هـ) لا ينطبق	e	

Table 1. Baseline characteristics

Table 1. Baseline characteristics		
Age, years	Median (IQR)	77 (68, 82)
Gender	Male	32 (46.4)
MoCA	Median (IQR)	11 (5, 23)
Katz ADL Scale	Median (IQR)	4 (2, 6)
BADLS	Median (IQR)	19 (3, 40)
Diagnosis		
	No dementia	15 (21.7)
	Mild cognitive impairment	16 (23.2)
	Dementia	38 (55.1)
Informant	Daughter	36 (52.2)
	Husband	2 (2.9)
	Mother	2 (2.9)
	Sister	1 (1.5)
	Son	26 (36.7)
	Wife	2 (2.9)
Education level	Illiterate	16 (23.2)
	Literate / > 4year education	15 (21.7)
	primary school	3 (4.4)
	intermediate school	3 (4.4)
	high school	9 (13.0)
	College/technical	19 (27.5)
	Postgraduate	4 (5.8)
Note. All values are N (%) except when indicated		

Table 2. BADLS Item- total statistics

Table 2. Item- total statistics				
Item	Mean	SD	Item-total correlation	Alpha if item deleted
Food preparation	0.94	1.31	0.50	0.95
Eating	0.65	1.01	0.71	0.95
Drink preparation	1.15	1.41	0.71	0.95
Drinking	0.36	0.92	0.56	0.95
Dressing	1.10	1.15	0.82	0.94
Hygiene	1.10	1.25	0.90	0.94
Teeth	0.98	1.25	0.78	0.95
Bathing	1.37	1.35	0.84	0.94
Toilet/commode	0.85	1.12	0.79	0.95
Transfer	1.13	1.21	0.84	0.94
Mobility	1.23	1.17	0.74	0.95
Orientation to time	1.10	1.13	0.75	0.95
Orientation to space	0.84	1.06	0.71	0.95
Communication	0.78	0.99	0.78	0.95
Telephone	1.23	1.18	0.80	0.94
Housework	1.13	1.36	0.58	0.95
Shopping	1.53	1.30	0.71	0.95
Finances	1.43	1.37	0.82	0.94
Games & hobbies	1.11	1.35	0.48	0.95
Transportation	1.40	1.30	0.74	0.95

Table 3. Correlation matrix

Table 3. Correlation matrix			
	Total Arabic BADLS	Total Arabic Katz ADL	Total MoCA
Total katz ADL	-0.86 ‡		
Total MoCA	-0.82 ‡	0.74 ‡	
Age	0.52 ‡	-0.51 ‡	-0.62 ‡

Note. ‡ $p < .001$, † $p < .01$, * $p < .05$

Table 4. Univariate regression

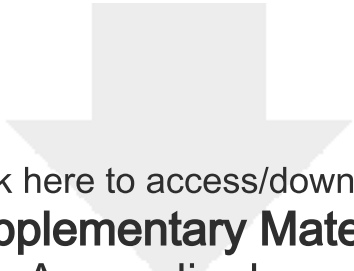
Table 4. Univariate regressions analyses for the dependant variable BADLS score					
	B	Standard Error	P- value	95% CI	R²
Every 5 years increase in age >65	2.72	0.54	< .001	1.6, 3.8	0.27
Sex, female	8.23	4.20	0.05	-0.2, 16.6	0.05
> 6 years of education	-16.10	3.84	< .001	-23.8, -8.4	0.20
R² Proportion of heterogenicity explained by the model					

Table 5. Multivariate regression

Table 5. Multivariate regression analyses for the dependant variable BADLS score				
	B	Standard Error	P- value	95% CI
Every 5 years increase in age >65	2.75	0.52	< .001	1.70, 3.81
Sex, female	8.73	3.56	.017	1.62, 15.86
constant	12.79	2.73	<.001	7.33, 18.25

Table 6. Frequency of use of ‘not applicable’ item on the BADLS

Table 6. Frequency of use of ‘not applicable’ item on the BADLS				
Item	N	%	male	female, N
Food preparation	30	43.5	23	7
Eating	1	1.4	1	0
Drink preparation	16	23.2	13	3
Drinking	0	-	-	-
Dressing	1	1.4	0	1
Hygiene	0	-	-	-
Teeth	8	11.6	4	4
Bathing	0	-	-	-
Toilet/commode	1	1.4	0	1
Transfer	1	1.4	1	0
Mobility	0	-	-	-
Orientation to time	1	1.4	1	0
Orientation to space	4	5.7	1	3
Communication	1	1.4	1	0
Telephone	0	-	-	-
Housework	26	37.7	17	9
Shopping	10	14.5	6	4
Finances	2	2.8	1	1
Games & hobbies	23	33.3	8	15
Transportation	14	20.3	3	11



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