BRIEF REPORT

The Bayer - Activities of Daily Living Scale (B-ADL) in the differentiation between mild to moderate dementia and normal aging

A escala da Bayer – Atividades da Vida Diária (B-AVD) na diferenciação entre demência leve e moderada e o envelhecimento normal

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Abstract

Objectives: To investigate the applicability of the Bayer - Activities of Daily Living scale and its efficiency in differentiating individuals with mild to moderate dementia from normal elderly controls. Method: We selected 33 patients with diagnosis of mild to severe dementia, according to ICD-10 criteria, and 59 controls. All the subjects were evaluated with the Mini-Mental State Examination and the Clinical Dementia Rating Scale and the Bayer - Activities of Daily Living scale was applied to informants. Results: The internal consistency of the Bayer - Activities of Daily Living was high (Cronbach's alpha = 0.981). Mean Mini-Mental State Examination and Bayer - Activities of Daily Living scores of demented patients and controls were significantly different ($p < 0.001$). Mean Mini-Mental State Examination and Bayer - Activities of Daily Living scores were significantly different between Clinical Dementia Rating Scale 0 (controls; n = 59) versus Clinical Dementia Rating Scale 1 (mild dementia; n = 15), Clinical Dementia Rating Scale 0 versus Clinical Dementia Rating Scale 2 (moderate dementia; n = 13), and for Clinical Dementia Rating Scale 1 versus Clinical Dementia Rating Scale 2 ($p < 0.003$). Discussion: The Bayer - Activities of Daily Living scale and Mini-Mental State Examination differentiated elderly controls from patients with mild or moderate dementia, and patients with mild dementia from those with moderate dementia. Conclusions: The results suggest that the Bayer - Activities of Daily Living scale applied to an informant can help in the diagnosis and follow-up of Brazilian patients with mild to moderate dementia.

Descriptors: Dementia; Diagnosis; Activities of daily living; MMSE; Ageing

Resumo

Objetivos: Investigar a aplicabilidade da escala Bayer - Atividades de Vida Diária e sua eficiência em diferenciar indivíduos com demência leve a moderada de indivíduos normais. Método: Foram selecionados 33 pacientes com diagnóstico de demência leve a grave, de acordo com os critérios da CID-10, e 59 controles. Todos os indivíduos foram avaliados pelo Mini-Exame do Estado Mental e pela Escala de Avaliação Clínica de Demência e os informantes responderam à Bayer - Atividades de Vida Diária. Resultados: A consistência interna da Bayer - Atividades de Vida Diária foi alta (Cronbach Alpha = 0,981). A pontuação média do Mini-Exame do Estado Mental e da Bayer - Atividades de Vida Diária foi significativamente diferente entre os pacientes com demência e o grupo controle ($p < 0,001$). Os valores do Mini-Exame do Estado Mental e da Bayer - Atividades de Vida Diária foram significativamente diferentes entre a Escala de Avaliação Clínica de Demência 0 (controles; n = 59) e a Escala de Avaliação Clínica de Demência 1 (demência leve; n = 15), a Escala de Avaliação Clínica de Demência 0 e a Escala de Avaliação Clínica de Demência 2 (demência moderada; n = 13) e entre a Escala de Avaliação Clínica de Demência 1 e a Escala de Avaliação Clínica de Demência 2 ($p < 0,003$). Discussão: A Bayer - Atividades de Vida Diária e o Mini-Exame do Estado Mental diferenciaram controles idosos de pacientes com demência leve ou moderada, e pacientes com demência leve daqueles com demência moderada. Conclusões: Os resultados sugerem que a Bayer - Atividades de Vida Diária, aplicada aos cuidadores, é um instrumento que pode ajudar no diagnóstico e seguimento de pacientes brasileiros com demência leve a moderada.

Descritores: Demência; Diagnóstico; Atividades cotidianas; MMSE; Envelhecimento

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Introduction

According to epidemiological studies, the prevalence of dementia in the Brazilian population aged 60-65 years or older is around 7.0%, with Alzheimer's Disease (AD) accounting for more than half of the cases.[1-2]

Dementia diagnosis is based on the quantification of the patient's cognitive deficits and also on impairment in the activities of daily living (ADL).[3] There is evidence that the ADL deficits can be present even in individuals with mild cognitive impairment, allowing early diagnosis.[4-5]

The Bayer - Activities of Daily Living scale (B-ADL) was developed with support of the Bayer Laboratories to be administered in different cultures to evaluate functional deficits in patients with mild to moderate dementia.[6-7] The Brazilian version of the scale was adapted to Brazilian Portuguese and tested by the "MAPI Research Institute".[8]

The final version of the B-ADL consists of 25 items[4] to be answered by the caregiver.[6-7] The first two items evaluate the patient's ability to handle the ADL and his/her capacity to care for himself/herself. Items three to twenty evaluate specific tasks and the last five items assess cognitive functions important for performing activities of daily living.[4]

The objective of this article is to evaluate the applicability of the B-ADL in a Brazilian outpatient sample evaluating its efficacy in discriminating between healthy elderly individuals and demented patients and, also, in the dementia group, to investigate the ability of the scale to discriminate between mild and moderate dementia cases.

Method

1. Sampling

The subjects were selected among outpatients of the Old Age Research Group (PROTER), Institute of Psychiatry, School of Medicine, Universidade de São Paulo (HCFMUSP). The inclusion criteria were: 60 years or older, and a clinical diagnosis of mild to moderate dementia, made by two trained psychiatrists according to ICD-10[4] criteria. Exclusion criteria were: presence of other psychiatric disorders observed during the clinical evaluation or absence of informants capable of providing reliable information about the patients previous and current health condition (informants - one for each patient - were relatives, non-paid caregivers).

The control group was selected among outpatients of the geriatric service of the HCFMUSP and among relatives of the PROTER patients. Inclusion criteria were: age > 60 years, absence of psychiatric diseases detectable by the Psychiatric Screening Questionnaire (SRQ-20)[9-10] (score below 6) and absence of cognitive deficit indicated by the Abbreviated Mental Test Score (AMTS)[11] (score above 7). Exclusion criteria were current use of psychotropic drugs and absence of reliable informants.

The study was approved by the research ethics committee of HCFMUSP (nr. 698/00) and only those who gave written informed consent were included in the present study.

2. Procedure and statistical analysis

We administered the Mini-Mental State Examination (MMSE),[12-13] and the CDR (Clinical Dementia Rating) scale to the selected individuals (subjects and controls). The CDR evaluates dementia severity and rates severity as absent, questionable, mild, moderate and severe.[14] Each B-ADL item is rated from 1 to 10 and the following answers can also be provided: "I don't know" or "not applicable". The final result (with two decimals) is given by the sum of the ratings divided by the number of items rated (excluding the questions answered as "I don't know" or "not applicable"), and higher scores correspond to more severe deficits.[4,6] The instruments (MMSE and B-ADL) were administered by trained physicians, blind to the health condition and clinical diagnosis of the individuals. Statistical analysis was made using the statistical software package SPSS version 11.0. The ROC curve was performed using Medcalc Statistical Software version 8.2.

First, the applicability of the B-ADL as a whole and the applicability of each one of its items were investigated. The frequency of the "not applicable" answers for the whole scale and for each item was calculated. We used the Cronbach's alpha coefficient to verify the internal consistency of the B-ADL.

Afterwards, the sample was divided into patients and elderly controls, and the Student t-test was applied to the age and schooling means of the groups. The Mann-Whitney U non-parametric test was used to compare the scores of the MMSE and the B-ADL between the groups.

On a subsequent analysis, the sample was divided according to the CDR score and the individuals with CDR = 0.5 were added to the group with CDR = 1.0, whereas subjects with CDR = 3.0 were excluded from the analysis. Thus, 3 groups were formed: CDR = 0, CDR = 1.0 and CDR = 2.0. The analysis of the MMSE and B-ADL between the 3 CDR groups was made using the nonparametric Kruskal-Wallis test, followed by the Mann-Whitney U Test for pairwise comparisons, with Bonferroni correction for multiple testing.

Results

Ninety-two individuals (33 demented patients and 59 controls) were selected. The sociodemographic characteristics of the groups are presented in Table 1.

The percentage of "not applicable" answers for the whole B-ADL was 2.0%. For each individual item, frequency of "not applicable" answers was higher than 10.0% only in two items: item 6 and 13 (respectively, 11.1% and 14.4%). Two subjects of the control group were excluded of this analysis because of missing data.

The internal consistency of the B-ADL according to the Cronbach's alpha coefficient was 0.981.

The patients were significantly different from the controls regarding the MMSE (MWU = 117.00; $p < 0.001$) and the B-ADL (MWU = 51.00; $p < 0.001$) scores.

According to the CDR, 59 individuals where classified as CDR = 0; two as CDR = 0.5; 13 as CDR = 1.0; 13 as CDR = 2.0 and five as CDR = 3.0. Excluding the subjects classified as

Table 1 - Characteristics of the sample

Diagnostic		Dementia	Controls	Total
Sex	Male	15 (45.5%)	12 (20.3%)	27 (29.3%)
	Female	18 (54.5%)	47 (79.7%)	65 (70.7%)
Age	Mean	73.82	69.25	70.89
	SD	5.88	5.31	5.91
Schooling (in years)	Mean	5.34	4.71	4.94
	SD	3.99	3.71	3.80
MMSE	Mean	**19.72**	**27.94**	**25.00**
	SD	6.06	1.96	5.57
B-ADL	Mean	6.43	1.70	3.40
	SD	2.25	0.78	2.71

SD: Standard deviation

Table 2 - MMSE and B-ADL scores on three groups divided according to the CDR scale

Statistical		CDR = 0 (Control; n= 59)	CDR = 1 (n = 15)	CDR = 2 (n = 13)	p value
MMSE	Mean	27.90** #	24.80##	16.90	KW = 45.64*
	SD	1.96	1.76	5.00	p < 0.001
B-ADL	Mean	1.70** #	4.66##	7.73	KW = 51.17*
	SD	0.78	1.77	1.46	p < 0.001

*Difference between three groups using Kruskal-Wallis; SD: Standard deviation Mann-Whitney U for pairwise comparisons: **CDR = 0 vs. CDR = 1: p < 0.003; #CDR = 0 vs. CDR = 2: p < 0.003; ##CDR = 1 vs. CDR = 2: p < 0.003.

CDR = 3.0 and adding the CDR= 0.5 individuals to the group with CDR = 1.0, our sample was divided into three groups: CDR = 0 (control group; n = 59), CDR = 1 (n = 15) and CDR = 2 (n = 13).

The results of the comparisons regarding the MMSE and B-ADL scores are shown in Table 2.

Considering the sample of 59 controls and 33 patients, the area under the ROC curve for the B-ADL was 0.97 (p < 0.0001, 95% Confidence Interval: 0.94-1.00), and for the MMSE it was 0.94 (p < 0.0001, 95% Confidence Interval: 0.89-0.98). The difference between the areas was 0.034, non significant (p = 0.19) (Figure 1). Two cutoff points were selected (based on their sensitivity, specificity, positive predictive value and negative predictive value) for the B-ADL: 2.58 and 3.12 (Table 3).

Discussion

To verify the applicability of the B-ADL and of its individual items, Erzigkeit et al. considered acceptable a proportion of "not applicable" answers lower than 5% for the whole scale, and lower than 10.0% for each individual item.[7] In our study, the proportion of "not applicable" answers for the scale as a whole was 2.0%, and only two items had a percentage over 10.0%, an acceptable performance, since there were three to five items with percentages of "not applicable" higher than 10.0% in the study mentioned above.

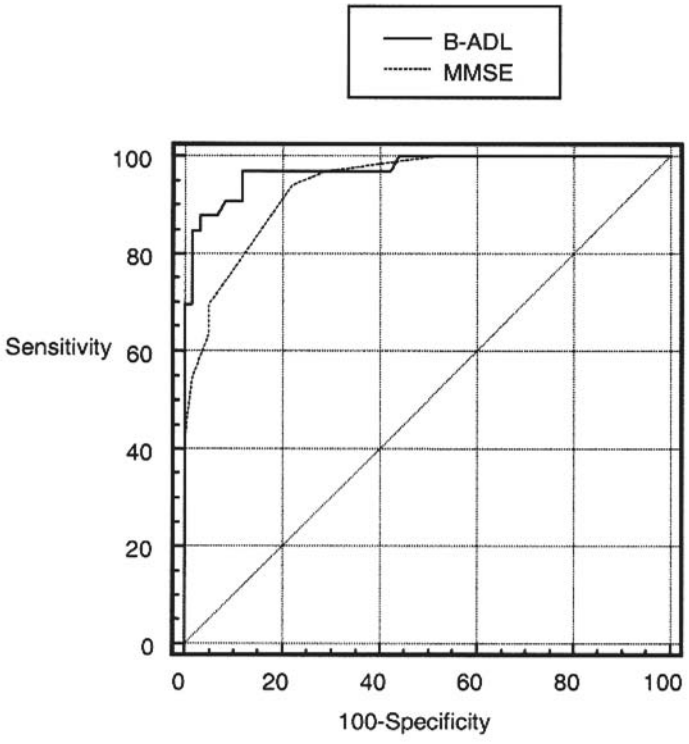

Figure 1 - ROC Curve – MMSE and B-ADL

Table 3 - Cutoff points for the B-ADL*

Cutoff point	Sensitivity	Specificity	PPV**	NPV***
2.58	97.0	88.1	82.1	98.1
3.12	87.9	96.6	93.5	93.4

*Calculated for a 7.0% dementia prevalence; **PPV = Positive Predictive Value; ***NPV = Negative Predictive Value

Question 6 had 11.1% of "not applicable" answers, which was expected, since this item evaluates the capacity of concentration when reading and we tested a population with low schooling (average of 4.86 years). Question 13 (ability to cook) had 14.4% of "not applicable" answers, with 39.9% of the caregivers of male subjects giving this answer (representing 84.6% of the total "not applicable" answers) against only 3.2% of the caregivers of female subjects. This was also expected in this sample since in Brazil cooking is predominantly a female activity.

The B-ADL obtained, in our sample, an internal consistency index higher than 0.98, which means a very high intercorrelation between the items, similar to the values found by Erzigkeit et al. in Europe.[7]

In the present study, the MMSE was capable of discriminating between patients and controls and between mild and moderate demented subjects. Several studies demonstrated that the MMSE can differentiate patients with dementia from healthy individuals often using the cutoff point 23/24 (cases/not cases).[15]

The B-ADL showed efficiency in the discrimination between cases and controls and also in the differentiation between mild and moderate dementia cases, according to the study by Erzegkeit et al. in which the B-ADL was considered adequate to differentiate the subjects classified in different stages of disease severity.[7] These results suggest that the B-ADL may also be useful in the follow-up and treatment evaluation of dementia patients documenting the impairment in activities of daily living at various disease stages.

In the present study, the B-ADL showed an area under the ROC curve similar to the one found by Erzigkeit et al.[7] and the accuracy of dementia diagnosis by the B-ADL was statistically similar to the MMSE. The cutoff point ≥ 2.58 showed a high sensitivity, but the specificity was not so high (some individuals were false positives) giving a low predictive positive value. The second cutoff point selected (≥ 3.12) presented a better balance between sensitivity and specificity, providing better balance regarding the positive and negative predictive values. The second cutoff point would be probably better for epidemiological studies because it showed a good sensitivity and, besides selecting the suspected cases adequately, it had a good specificity (not selecting many false-positives). Those characteristics would make the second cutoff point more suitable for a possible eventual epidemiological study, making a second or diagnostic phase of such a study less expensive.

A possible methodological limitation of our study is the fact that the caregivers of elderly patients attending a health service could be particularly involved with them and very good observers leading to a higher accuracy of the B-ADL. There was also an excess of females in the control group, but without an impact on the applicability of the B-ADL and of its individual items in the studied sample, as pointed out earlier.

Conclusions

The Brazilian version of the B-ADL showed good applicability and high internal consistency in this outpatient sample of elderly subjects. The scale discriminated patients with mild to moderate dementia from normal elderly controls and differentiated subjects classified according to the CDR scale at various levels of cognitive impairment. To select the best cutoff point, the clinician or researcher should consider the context of application of the scale and the type of study being performed.

The results suggest that the B-ADL administered to an informant is a useful instrument for the diagnosis and follow-up of mild to moderate demented patients in Brazil.

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