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Original article

Phototest: Normative data for the Portuguese population

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ABSTRACT

Background: The Phototest is a brief cognitive test, which is easy to administer and has better diagnostic accuracy and effectiveness for cognitive impairment and dementia than traditional screening tests. This study aims to obtain the normative data of the Phototest for the Portuguese population and to determine the reliability and convergent validity of the test.
Methods: The study enrolled a convenience sample consisting of healthy volunteers (n = 130). The normal distribution of the results was tested. Multiple linear regression was used to determine the predictive variables for the Phototest.
Results: Age and educational level were identified as predictive variables by multiple regression analysis, and these accounted for 58% of the variance in the test results. Therefore, the two variables were included in the table with normative data of the Phototest. The Cronbach α of the test is 0.73. The results of the Phototest correlate positively with the results of other tests.
Conclusion: The Phototest results are influenced by age and educational level. Our results point to a good reliability and concurrent validity with a more extensive test. The availability of the Phototest normative data for the Portuguese population based on age and educational level enables the use of a brief screening tool for cognitive functioning.

1. Introduction

Dementia and cognitive impairment constitute a serious worldwide problem. Dementia is among the top 10 of the leading causes of burden of diseases in high-income countries.[1] In Western Europe, the prevalence of dementia in people over the age of 60 years is estimated to be 7.3%, with the number of cases expected to increase up to 40% by 2030.[2] International guidelines recommend using general cognitive screening tests to identify individuals suspected to have cognitive impairment.[3,4] Administering these tests is especially useful in primary-care settings, where dementia and cognitive impairment are often underdiagnosed because of the high number of patients managed by a single physician and the limited availability of medical equipment.[5,6] Therefore, cognitive assessment is central to diagnosis and management of dementia.[4] Eventually, the use of screening tests with high diagnostic utility, simplicity, celerity, and normative data for the target population is important in a time-constrained practice.[5,7]

The Phototest (www.fototest.es) is a brief (<3 minutes) cognitive test, which is easy to administer and assesses several cognitive domains (language, episodic memory, and verbal fluency).[8,9] It includes the following three parts: a naming task with six color photographs of common objects; a categorical verbal fluency task in which patients must evoke masculine and feminine names; and free and cued recall of the six objects used in the naming task. The Phototest was developed in Spain and has proven high diagnostic accuracy and effectiveness for cognitive impairment and dementia, even when compared with more traditional screening tests such as the Mini-Mental State Examination[7–9] or the Memory Alteration Test.[10] It has been demonstrated that cutoff points of 26 and 28 offer satisfactory discriminant validity for Alzheimer's disease and cognitive impairment, respectively.[11] In addition, the test also has good test–retest and interobserver reliability.[12] Considering costs

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based on public prices and hospital accounts, the costs involved with the use of the Phototest are considerably lesser in comparison with other screening tests.[10,11] Because reading is not required and there are no pencil and paper tasks, this test is suitable for use with illiterates or individuals with a low level of education.[8]

In the normative study[12] for the Spanish population, the Phototest results are normally distributed and are not influenced by sex or education but they are age dependent. The Argentine study performed with a sample of senior Spanish immigrants found no influence from education, age, or sex on test results.[13]

Because the clinical value of a test is limited without the possibility to compare the individual performance with a reference group, this work aims to obtain the normative data of the Phototest for the Portuguese population, and to determine the influence of sociodemographic variables on the test's performance. The reliability (internal consistency) and convergent validity were also determined.

2. Methods

2.1. Participants

The study enrolled a convenience sample consisting of 130 individuals of both sexes. The age of the participants was between 36 years and 87 years [mean (M) = 58.35; standard deviation (SD) = 14.66] and they had various years of schooling (M = 7.39; SD = 4.16). The participants were without any subjective complaints of memory loss and were completely independent in daily life activities. Individuals with a prior history of neuropsychiatric or systemic pathologies that may interfere directly on neurocognitive functioning were excluded. Individuals with results equal or lower than one SD on the Montreal Cognitive Assessment (MoCA) and clinically significant values of depression on Beck's Brief Depression Inventory were also excluded from the study. Our study population included members who were employees of health units, schools, factories, and patient's relatives from several health units in various districts of Portugal. The characteristics of the study population are presented in Table 1.

2.2. Materials

Besides Phototest, the following instruments were administered: a questionnaire to collect the sociodemographic information; an inventory about the health status and clinical history of the participants; the MoCA[14,15]; and Beck's Depression Inventory.[16] The MoCA was selected to include and exclude participants and to obtain the convergent validity due to its high specificity (87%) and sensibility (90%) in detecting mild cognitive impairment.[17]

Table 1
Sociodemographic characteristics of the sample.

	n (%)
Age (y)	
<50	53 (40.8)
51–64	26 (20)
>65	51 (39.2)
Sex	
Male	62 (47.7)
Female	68 (52.3)
Level of education	
≤7 y	71 (54.6)
>7 y	59 (45.4)
District	
Porto	35 (26.9)
Viana do Castelo	21 (16.2)
Coimbra	18 (13.8)
Braga	18 (13.8)
Vila Real	14 (10.8)
Aveiro	13 (10)
Bragança	6 (4.6)
Ponta Delgada	5 (3.9)

2.3. Procedure

The instruments were administered to all participants in a closed room in the following order: the sociodemographic questionnaire, the health status and clinical history inventory, the MoCA, Beck's Depression Inventory, and finally the Phototest. In those institutions with an ethical committee, relevant approvals for the study were obtained. All the participants gave their informed consent for participation in this study.

2.4. Statistical analysis

Statistical analysis was carried out using IBM SPSS Statistics, version 21 for Windows (IBM, Armonk, NY, USA). The Kolmogorov–Smirnov (KS) test was used to test the normal distribution of the results. The influence of age on Phototest results was tested through the univariate (1-way) analysis of variance and the district of origin was tested through the Kruskal–Wallis (KW) test. The relation between sex and educational level and the results on Phototest was tested by a Student *t* test. Multiple linear regression, using the enter method, was used to examine the significance of age and educational level as influencing factors for Phototest.

In addition, Cronbach α was used to determine Phototest's reliability and Pearson's correlation was used to define the concurrent validity with the MoCA.

3. Results

Phototest results ranged between 23 points and 51 points (average score = 38.12; SD = 7.12). Therefore, the cutoff scores according to 1 SD, 1.5 SD, and 2 SD for the entire sample are 31, 27, and 24, respectively. The obtained results show a normal distribution (KS = 1.008; $p = 0.261$; Fig. 1). The Phototest results were significantly influenced by age [$F(2,127) = 8.772$ ($p \leq 0.001$)], education ($t = 2.69$, $p = 0.008$), and sex ($t = 1.926$, $p = 0.035$). There were no differences regarding the district of origin (KW = 6.472, $p = 0.486$). However, the multiple linear regression analysis shows

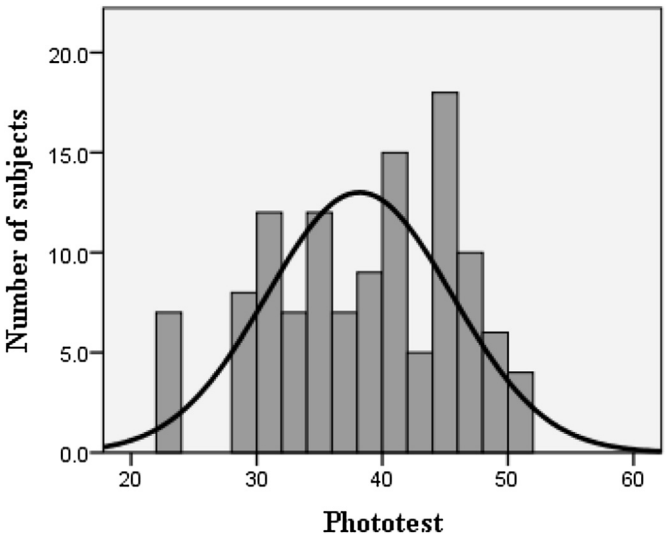

Fig. 1. Distribution of the results on Phototest.