



Mestrado em Psicologia da Saúde e Neuropsicologia

O *Test des Neuf Images 93*: estudo preliminar de validade e dados normativos numa amostra portuguesa de idosos analfabetos e com baixo nível de escolaridade

(The *Test des Neuf Images 93*: preliminary study of validity and normative data in a Portuguese sample of illiterate and low educated elderly)

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Agradecimentos

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Resumo

Objetivo: Um dos desafios da avaliação neuropsicológica para o rastreio da deterioração cognitiva / comprometimento cognitivo leve / demência em pessoas com idade ≥ 60 anos com iliteracia, iliteracia funcional ou baixo nível de escolaridade deve-se a criação e uso de testes adequados. O presente estudo, baseia-se numa amostra de portugueses idosos, que teve como objetivo avaliar as características da validade convergente e divergente e estabelecer os dados normativos preliminares para a versão em português do Test des Neuf Images 93 (TNI-93), um teste de memória episódica não-verbal em imagens.

Método: Amostra em “bola de neve” (Snowball) de 115 idosos (≥ 60 anos), sem queixas mnésicas e autónomos nas atividades de vida diária foram avaliados com as versões Portuguesas do TNI-93, Addenbrook's Examination III (ACE III) e Escala de Depressão Geriátrica (GDS).

Resultados: As correlações entre o TNI-93 e as pontuações totais e as subtotais do ACE-III foram significativas, embora moderadas, enquanto que, a correlação entre TNI-93 e a GDS, apesar de negativa, mostrou-se baixa e não significativa.

Apenas a faixa etária correlacionava com a pontuação do TNI-93, com diferenças significativas entre os grupos com idades compreendidas entre 60-70 e ≥ 81 anos. A análise de regressão múltipla comprovou que a idade é o principal preditor da pontuação total no TNI-93.

Conclusões: Os nossos resultados mostram valores moderados de validade convergente e a interferência da idade mas não do género ou do nível de escolaridade nos resultados do TNI-93.

Desenvolveram-se dados normativos preliminares, assim como uma fórmula para calcular os resultados esperados e a pontuação z. O TNI-93 mostra-se um instrumento promissor de rastreio breve para a deteção de deterioração cognitiva/defeito cognitivo ligeiro/demência em pessoas com idade ≥ 60 anos com iliteracia, iliteracia funcional ou baixo nível de escolaridade.

Abstract

Objective: One of the challenges to neuropsychological assessment for screening of cognitive deterioration/mild cognitive defect/dementia in people aged ≥ 60 years with illiteracy, functional illiteracy or low level of schooling refers to the appropriateness of the tests used. The present study, based on a sample of Portuguese elderly, aimed to evaluate the characteristics of convergent and divergent validity and to establish preliminary normative data for the Portuguese version of the *Test des Neuf Images 93 (TNI-93)*, a non-verbal episodic memory test in images.

Method: A snowball sample of 115 older adults (≥ 60 years), without mnesic complaints and autonomous in daily living activities were assessed with the Portuguese versions of *TNI-93*, Addenbrook's Examination III (ACE III) and Geriatric Depression Scale (GDS).

Results: Correlations between TNI-93 and ACE-III total score and subscores were significant, though moderate. Correlation between TNI-93 and GDS was negative but low and non-significant. Only age group was related to TNI-93 score with significant differences between 60-70 and ≥ 81 years old groups. Multiple regression analysis showed age as the main predictor of TNI-93 total score.

Conclusions: Our results show moderate values of convergent validity and the influence of age but not of gender or years of schooling on TNI-93 score. Preliminary normative data and a formula to compute expected results and a z score was developed. TNI-93 may be a promising brief screening tool for detection of cognitive deterioration/mild cognitive defect/dementia in people aged ≥ 60 years with illiteracy, functional illiteracy or low level of schooling.

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I. Introdução

O crescimento da esperança média de vida e da longevidade, traduz-se num aumento da população idosa [proporção de pessoas com idade igual ou superior a 65 anos em Portugal] que cresceu de 8% em 1960 para 17% em 2005 e 19% em 2011; o índice de envelhecimento em 2001 foi de 102 (100 jovens para 102 idosos), em 2011 de 128 e em 2013 de 136 (INE, Censos 2011; INE, Censos 2014; Santana, Farinha, Freitas, Rodrigues, & Carvalho, 2015) o que conduziu a um aumento do risco de morbididades, a saber patologias neurodegenerativas associadas ao declínio cognitivo normal e sua exacerbação.

Com base nos resultados de Santana et al. (2015), podemos então extrapolar que em 2018 teremos 21 885 novos casos em Portugal em comparação com 2013, ou seja, uma estimativa de 182 172 casos de demência na faixa etária acima de 60 anos.

A prevalência de demência aos 60 anos situa-se entre 5-7%. A incidência tem aumentado de 7.5 / 1000 por ano em 2005, para 7.7 / 1000 por ano em 2012 (Ferri, et al., 2005; Santana, Farinha, Freitas, Rodrigues, & Carvalho, 2015, Organização Mundial da Saúde, 2012, Alzheimer's Disease International, 2012).

O aumento da prevalência de demência entre indivíduos iliteratos pode ser explicado por vários fatores, que não são necessariamente exclusivos. Podem ser relacionados aos procedimentos de avaliação (por exemplo, viés de teste, falta de sabedoria de teste), mas também a fatores predisponentes baseados na vida e / ou educação. Analisando o potencial viés dos testes utilizados acima referidos, constatou-se que muitas investigações às quais eram ajustadas pontuações de corte, era presumível que os testes fossem apropriados para iliteratos (Zhang et al., 1990), ou que incluíssem critérios adicionais, como por exemplo, questionários de informantes (Herrera et al., 2002; Nitrini et al., 2004) e/ou avaliação de atividades de vida diárias (ADLs) (Kwon et al., 2012) (Kosmidis, 2017).

Uma das consequências associadas à demência, para além da mortalidade, é a morbilidade. Assunto ao qual merece um pouco mais de atenção, porque ao compararmos o número de pessoas com idade ≥ 60 anos detentores de incapacidade, podemos ver estimativas de 2,4% para todas as formas de cancro, 5,0% para doença cardiovascular, 9,5% para acidente vascular cerebral, enquanto que na demência, a estimativa é de 11,9% (Santana, Farinha, Freitas, Rodrigues, & Carvalho, 2015; Organização Mundial da Saúde, 2003, 2012; Alzheimer's Disease International, 2012).

Presumindo que o surgimento de demência na população idosa poderá incidir nos indivíduos com iliteracia, iliteracia funcional ou baixa escolaridade, visto que representam uma percentagem importante (cerca de 77,7%) da população com idade ≥ 60 anos (INE, Censos 2011) entende-se que a escolaridade desenvolve estratégias cognitivas (tanto explícitas quanto implícitas) na organização e retenção de informação; na capacidade de concentração; na admissão de acompanhamento médico; e até mesmo na motivação interna para um bom desempenho (Kosmidis, 2017).

Efetivamente, os instrumentos de medição em uso têm vários vieses na avaliação dessa subpopulação: (1) Itens compostos por tarefas de "laboratório" ou "tipo de escola", envolvendo leitura, escrita, cálculo, velocidade de resposta e afins. Desta forma, tais procedimentos tomam como certos conhecimentos específicos de "socialização" dentro de um sistema escolar, que pode contribuir para uma superestimativa/hiperdiagnóstico do défice cognitivo nessa subpopulação. A literatura publicada sobre correlatos cognitivos de analfabetismo/iliteracia mostra, além de diferenças quantitativas, a existência de diferenças qualitativas, em termos de estratégias cognitivas usadas para resolver itens, e também diferenças cerebrais funcionais e estruturais, entre idosos alfabetizados e iliteratos; (2) Um fator potencial adicional com impacto no desenvolvimento e funcionamento do cérebro pode ser representado pela falta de oportunidades e privação precoce de necessidades básicas (habitação, nutrição, saúde) ligadas ao baixo estado socioeconómico dessa subpopulação (Kosmidis, 2017).

Embora nenhum dos instrumentos seja completamente isento de problemas, o nosso estudo enquadra-se na perspectiva de um teste neuropsicológico rápido de rastreio não-verbal para MCD / demência, pois apela à memória episódica e é baseado em nove desenhos a preto e branco - Test des Neuf Images / TNI 93 (Dessi, F. et al., 2009; Mailliet, D. et al., 2016), que não implica "escolaridade" e cuja as áreas avaliadas (memória episódica de objetos / recordação livre e dirigida) não tem demonstrado diferenças entre as populações alfabetizadas ou iliteratas (Folia & Kosmidis, 2003; Mokri et al., 2012; Nitrini et al., 2004).

O artigo "O Test des Neuf Images 93: estudo preliminar de validade e dados normativos numa amostra portuguesa de idosos analfabetos e com baixo nível de escolaridade" é composto por uma amostra Snowball, envolvendo 115 participantes (com idades ≥ 60 anos). A colheita dessa mesma amostra ocorreu em lares/centros de dias, e alguns dos casos nas suas próprias habitações quando autorizado pelos mesmos.

Nos critérios de inclusão os participantes não poderiam apresentar queixas amnésicas e teriam de ser autónomos nas suas atividades de vida diárias. O protocolo de avaliação integrava as versões portuguesas do TNI-93 Addenbrook's Examination III (ACE-III) e a GDS.

II. Manuscrito

The *Test des Neuf Images 93*: preliminary study of validity and normative data in a Portuguese sample of illiterate and low educated elderly

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Abstract

Objective: One of the challenges to neuropsychological assessment for screening of cognitive deterioration/mild cognitive defect/dementia in people aged ≥ 60 years with illiteracy, functional illiteracy or low level of schooling refers to the appropriateness of the tests used. The present study, based on a sample of Portuguese elderly, aimed to evaluate the characteristics of convergent and divergent validity and to establish preliminary normative data for the Portuguese version of the *Test des Neuf Images 93 (TNI-93)*, a non-verbal episodic memory test in images.

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Conclusions: Our results show moderate values of convergent validity and the influence of age but not of gender or years of

schooling on TNI-93 score. Preliminary normative data and a formula to compute expected results and a z score was developed. TNI-93 may be a promising brief screening tool for detection of cognitive deterioration/mild cognitive defect/dementia in people aged ≥ 60 years with illiteracy, functional illiteracy or low level of schooling.

Keywords: Assessment; Dementia; Mild cognitive impairment; Elderly/Geriatrics/Aging; Learning and memory; Norms/normative studies

Introduction

The successive increase in average life expectancy and longevity, which translates into an increase in the elderly population [the proportion of people aged 65 and over in Portugal rose from 8% in 1960 to 17% in 2005 and 19% in 2011; the index of aging in 2001 was 102 (100 young people for 102 elderly), in 2011 it was of 128 and in 2013 of 136 (INE, Censos 2011; INE, Censos 2014; Santana, Farinha, Freitas, Rodrigues, & Carvalho, 2015), leads to an increased risk of morbidities, namely neurodegenerative pathologies associated with normal cognitive decline and its exacerbation.

Among the neurodegenerative pathologies, it is worth highlighting the dementia pictures as clinical expression of different pathological entities and that present incidence and prevalence that increase exponentially with age, practically doubling every 5 years, after 60 years of age (Bermejo-Pareja, Benito-León, Vega, Medrano, & Román, 2008; Fratiglioni, Ronchi, & Agüero-Torres, 1999; Hofman et al., 1991; Jorm & Jolley, 1998; Kawas, 2008; Santana, Farinha, Freitas, Rodrigues & Carvalho, 2015; Von Strauss, Viitanen, De Ronchi, Winblad & Fratiglioni, 1999).

The prevalence of dementia at the age of 60 years is between 5-7% and the incidence has been increasing from 7.5/1000 per year in 2005 to 7.7/1000 per year in 2012 (Ferri, et al., 2005; Santana,

Farinha, Freitas, Rodrigues, & Carvalho, 2015; World Health Organization, 2012; Alzheimer's Disease International, 2012). More relevant than the mortality associated with dementia is morbidity. In fact, if we compare the number of years people aged ≥ 60 years live with disability, we can see estimates of 2.4% for all forms of cancer, 5.0% for cardiovascular disease, 9.5% for stroke, while, for dementia, the estimate is 11.9% (Santana, Farinha, Freitas, Rodrigues, & Carvalho, 2015; World Health Organization, 2003, 2012; Alzheimer's Disease International, 2012). This translates into a huge direct and indirect economic burden on the national health system, on society and on families.

Between 2003 and 2008, Nunes, Silva and Silva (Nunes, Silva, & Silva, 2008; Nunes et al., 2010; Santana, Farinha, Freitas, Rodrigues, & Carvalho, 2015) carried out the first study to determine the prevalence of mild cognitive defect (MCD) and dementia in Portugal, in a sample of the population aged 55-79 years. This study revealed dementia and MCD prevalence of, respectively, 2.7% and 12.3%.

Also, Santana et al. (2015) in a study based on the Estimates of the Resident Population in Portugal on June 2014 and estimates of dementia prevalence for the EURO A region, estimated the

prevalence of dementia in the age range ≥ 60 years and in 2013, to be 5.91%.

In the same study, and based on the same procedure, a perspective was drawn on the longitudinal evolution of these estimates, between 2003, 2008 and 2013, in which there was a successive increase in cases (120 506 cases in 2003; 17 884 new cases between 2003 and 2008 and an increase of 21 879 cases between 2008 and 2013), representing an average annual increase estimate of 4 377 new cases.

Based on the results of this study, we can then extrapolate that in 2018 we will have 21 885 new cases in Portugal compared to 2013, that is, an estimate of 182 172 cases of dementia in the age group above 60 years.

The neuropsychological evaluation and early diagnosis of MCD and dementia are therefore extremely important in the early detection of cognitive deterioration.

Within the elderly population, individuals with illiteracy, functional illiteracy or low educational level represent an important percentage (nearly 77.7%) of the population aged ≥ 60 years old (INE, Censos 2011).

Although the well-documented risk of illiteracy for cognitive impairment, there may be a trend on measures used in studies

documenting this link to overestimate/overdiagnose cognitive defect in this subpopulation.

One of the problems/challenges to neuropsychological assessment in terms of instruments (neuropsychological tests) for the early detection of MCD/cognitive deterioration/dementia in people aged \geq 60 years with illiteracy, functional illiteracy or low level of schooling refers to the appropriateness of the tests used for this subpopulation.

Effectively, the measuring instruments in use have several biases in the evaluation of this subpopulation: (1) Items composed of "laboratory" or "school type" tasks, involving reading, writing, calculation, response speed, etc. Such procedures take for granted specific knowledge and "socialization" within the school system. This may contribute to an overestimate/hyperdiagnosis of cognitive deficit in this subpopulation. The published literature on cognitive correlates of illiteracy/literacy shows, in addition to quantitative differences, the existence of qualitative differences in terms of cognitive strategies used to solve items and also functional and structural brain differences between literate and illiterate elders; (2) An additional potential factor with an impact on brain development and functioning may be represented by lack of opportunities and early deprivation of basic needs (housing, nutrition, health ...) linked

to the low socio-economic status of this subpopulation (see Kosmidis, 2017 for a revision on the subject).

Regarding the adequacy of neuropsychological tests for the assessment of cognitive defect and dementia in this subpopulation, several solutions have been explored: (1) Construction of new tests in which the format of the items simulate real-life rather than school-based activities (ecological validity) and eliminates items and areas that the investigation shows to disadvantage this subpopulation (Folia & Kosmidis, 2003; Kosmidis et al, 2003, 2011; Yassuda et al, 2009); (2) Adaptation of existing tests, through the establishment of specific norms for this subpopulation (Ardila, et al., 2010), suitability/alteration of items taking into account those types of items and areas that the investigation shows to disadvantage this subpopulation and alteration of the testing procedures, introducing sessions of training in tasks similar to the tasks involved in the test, in order to develop the familiarization and automation of processes, as proposed by Nell in 2000 (cit. in Kosmidis, 2017).

Although none of these attempts is problem-free, our study falls within the perspective of a rapid non-verbal screening neuropsychological test for MCD/dementia, appealing to episodic memory and based on nine black and white drawings - *Test des Neuf Images/TNI 93* (Dessi, F. et al., 2009; Maillet, D. et al., 2016) -

which does not imply "schooling" and whose area evaluated (episodic memory of objects/free and cued recall) has been demonstrated as not showing large differences between populations with or without literacy (Folia & Kosmidis, 2003; Mokri et al., 2012; Nitrini et al., 2004).

Methods

Participants

A snow-ball sample of the Portuguese population from the northern region (N = 115), from both genders (male = 20.9%; female = 79.1%), aged 60-97 years (M = 77.4; SD = 8.6) and with a level of schooling ranging from illiterate to four years (M = 2.21; SD = 1.7), without subjective mnesic complaints and autonomous in daily living activities. Individuals with neuropsychiatric history or other medical diagnosis that could interfere with their normal neurocognitive functioning were excluded.

The participants were recruited in day centers, nursing homes and in their homes, in the district of Porto/Portugal.

Materials

A sociodemographic questionnaire made for this study; The Portuguese version of TNI-93 (Dessi, et al., 2009; Maillet, et al., 2016), a non-verbal screening neuropsychological test for MCD/dementia, appealing to episodic memory and based on nine

black and white drawings of objects, body parts, animals, fruits and vegetables (bicycle, guitar, chair, shoe, fork, ear, duck, grapes and carrot) which does not imply "schooling" and whose area evaluated (episodic memory of objects/free and cued recall) has been demonstrated as not showing large differences between population with or without literacy. Total score may vary between 0-9 points, (sum of free and cued recall); the Portuguese versions of ACE-III (Machado, Baeta, Pimentel, & Peixoto, 2015; Peixoto et al., 2018) and of the GDS (Yesavage, et al., 1983).

ACE-III was included to establish TNI-93 convergent validity and GDS was included in order to establish TNI-93 divergent validity. Both ACE-III and GDS have proven solid psychometric properties and are widely used.

Procedures and Analysis

After approval by the original author, TNI-93 instructions for application and quotation were translated into Portuguese (once TNI-93 items are non-verbal there wasn't the need to use translation and retroversion). After obtaining written informed consent from all participants and authorization from institutions involved, the instruments were administered in a private room, in the following order: (1) Sociodemographic questionnaire; (2) TNI-93; (3) GDS (the

items and alternative responses were read in loud voice and the answers registered by the investigator); (4) ACE-III.

Statistical analysis was carried out using the program IBM Statistics version 24 for Windows. Kolmogorov-Smirnov (KS) test was used to test for normal distribution of results. Convergent validity was established by the correlation of the total TNI-93 score with ACE-III different scores and divergent validity established by the correlation between TNI-93 and GDS total scores.

The effect of age, gender, and educational level on TNI-93 performance was evaluated through Mann Whitney U and Kruskal-Wallis tests.

To determine the predictive model of TNI-93 scores, multiple linear regression analysis was performed. A normative equation was extracted in order to enable the determination of the expected score according to the predictive variables of TNI-93.

Significance was determined with $p \leq .05$.

Results

Descriptive Statistics: Demographic Characteristics of the Sample and tests scores

Descriptive statistics of the sample are showed in Table 1. The mean age was 77.4 years with a higher percentage of elders aged more than 71 years (71-80 years = 35.7%; ≥ 81 years = 40%). The

sample was predominantly female (79.1%) and mean educational level in years of schooling was 2.21 years with a predominance of 3-4 years (58.3%). Sample residence was predominantly at home (71.3%).

[Insert table 1]

Descriptive data for the tests scores for the total sample are shown in Table 2. TNI-93 total score had a mean of 8.36 ($SD = .98$); ACE-III total mean score was 56.83 ($SD = 15.1$), language subtest mean score was 16.55 ($SD = 4.70$), memory subtest mean score was 13.55 ($SD = 3.89$), Attention subtest mean score was 12.82 ($SD = 2.85$), Visuospatial subtest mean score was 8.43 ($SD = 3.40$) and Fluency subtest mean score was 5.49 ($SD = 3.13$). Finally, GDS total mean score was 11.48 ($SD = 6.5$).

[Insert table 2]

Table 3 shows the distribution of TNI total scores by age group, gender and educational level (in years). Mean results showed mean scores lowering with increasing age [60-70 years group mean = 8.68 ($SD = .82$); 71-80 years group mean = 8.39 ($SD = .83$); ≥ 81 years group mean = 8.13 ($SD = 1.15$)] and differences favoring females ($M = 8.41$; $SD = .94$) compared to males ($M = 8.17$; $SD = 1.13$) and 3-4 years educational level ($M = 8.54$; $SD = .79$) compared to 0-2 years ($M = 8.10$; $SD = 1.17$).

[Insert table 3]

Convergent and Divergent Validity: Correlations between TNI-93, ACE-III and GDS Scores

As can be seen in Table 3, TNI-93 total score showed positive and significant moderate correlations with ACE-III total score ($r = .381$, $p < .001$) and subscores (varying between $r = .278$ to $.369$ and $p \leq .001$ to $.002$) and a non-significant low negative correlation with GDS total score ($r = -.014$, $p = .878$).

Differences by Gender, Years of Schooling and Age in Years

Table 3 shows the results of the comparisons by gender, years of schooling and age in years) on TNI-93 total score. Although, as seen before, there are differences in the means between age in years groups, gender groups and education in years groups, only the differences between age in years groups show significance [$H = 6.086$ (2); $p = .048$]. When we tested for differences between pairs of age groups, only 60-70 years age group and ≥ 81 years age group showed significant differences ($H = 17.082$; $p_{adj} = .044$).

Multiple Linear Regression Model for TNI-93

The multiple linear regression model points to age ($p = .028$) as the main predictor of the performance on TNI-93 (Table 4). This model accounts for 8.1% of the results variance.

[Insert table 4]

From the multiple linear regression model, a predictive equation was extracted to calculate the expected score and, based on it, the correspondent z score of an individual with a given age on TNI-93.

$$\text{Expected score} = 10,393 - 0,026 \times \text{AGE (in years)}$$

and

$$z \text{ score} = (\text{raw score} - \text{expected score}) / \text{standard deviation}$$

Discussion

TNI-93 mean score in our sample (8.36) is higher than the mean score found by Dessi et al. (2009) (2.97) and similar to the ones found by Maillet et al. (2016) in their study with two samples of normal elderly (8.4 and 8.7).

ACE-III mean total score and subscores in our sample (Tt = 56.83; Att = 12.82; Mem = 13.55, FI = 5.49; Lg = 16.55; VS = 8.43) are lower than those found by Machado et al. (2015) in their ACE-III normative study (Tt = 89.4; Att = 17.16; Mem = 23.95, FI = 9.69; Lg = 25.13; VS = 13.47). Perhaps those differences reflect differences between samples. In fact, while Machado et al. study sample had a mean age of $70,41 \pm 7.96$ and a mean number of schooling years of 6.24 ± 4.07 , our sample's mean age was higher ($M = 77.4 \pm 8.6$) and with a lower mean number of schooling years ($M = 2.21 \pm 1.7$).

GDS showed higher mean scores in our sample (11.48 ± 6.5) than the study by Machado et al. (2015) (7.85 ± 4.26) perhaps due to difficulties in the interpretation of the questions related to low schooling.

Correlations between TNI-93 and ACE-III total score and subscores (r between .278 - .381) show moderate, although significant, convergent validity values.

The non-significant and low negative correlation between TNI-93 and GDS may be related to the small size and low educational level of our sample, proving low divergent validity.

In our sample TNI-93 score was influenced by age but not by gender or schooling. The differences in age and the absence of differences between genders are in accordance with those found by Dessi et al. (2009) and Maillet et al. (2016). However, the absence of differences in schooling years is not in accordance with the literature, perhaps due to the low range of schooling ($M = 2.21$, $range = 0 - 4$ years) in our sample but also proving that TNI-93 is an education free test.

Multiple regression analysis enabled the extraction of a normative equation to compare the performance of an individual with the results of our sample, based on expected results (according to age) and computation of a *z score*.

In conclusion, and although our results must be analyzed with caution because it is a preliminary study with limitations due, namely, to sample size and non-random sampling, TNI-93 proves to have acceptable convergent validity and being a promising brief education-free test for screening of MCD/Dementia for illiterate, functionally illiterate or low educational level elderly population. Future studies should consider random sampling, sample size and the establishment of TNI-93 sensitivity, specificity, positive and negative predictive power and cutoff scores in clinical contexts.

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Conflict of Interest

None to declare

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Tables

Table 1. Demographic information

Descriptive Variables	<i>N</i>	Percentage	<i>M</i>	<i>SD</i>	Range
Age (years)	115	-	77.4	8.6	60-97
60-70 years	28	24.3	65.5		60-70
71-80 years	41	35.7	74.8		71-80
≥ 81 years	46	40.0	85.6		81-97
Gender	115				
Male	24	20.9			
Female	91	79.1			
Educational Level (years of schooling)	115		2.21	1.7	0-4
0-2 years	48	41.7	0.3		0-2
3-4 years	67	58.3	3.6		3-4
Residence	115				
Home	82	71.3			
Nursing Home	33	28.7			

Note: *M* = mean; *SD* = standard deviation

Table 2. Descriptive statistics and correlations between TNI-93, ACE-III and GDS

Tests scores	<i>M (SD)</i>	TNI-93	GDS
		<i>r (p)</i>	<i>r (p)</i>
ACE III	--	--	--
Total (Tt)	56.83 (15.1)	.381 (<.001)	-.412 (< .001)
Attention (Att)	12.82 (2.85)	.302 (.001)	-.261 (.005)
Memory (Mem)	13.55 (3.89)	.287 (.002)	-.259 (.005)
Fluency (Fl)	5.49 (3.13)	.347 (<.001)	-.405 (<.001)
Language (Lg)	16.55 (4.70)	.369 (<.001)	-.402 (<.001)
Visuo-spatial (VS)	8.43 (3.40)	.278 (.003)	-.383 (<.001)
TNI-93	8.36 (.98)	--	-.014 (.878)
GDS	11.48 (6.5)	--	--

Note: *M* = mean; *SD* =standard deviation; *r* = correlation; *p* = significance level

Table 3. Differences by age group, gender and educational level on TNI-93 total score (Kruskal-Wallis *H* and Mann-Whitney *U*)

	TNI-93 total score					
	<i>N</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	Range	<i>H(df) / U; p</i>
Age Group (in years)	115	--	--	--	--	--
60-70 years	28	8.68	.82	9.00	5-9	
71-80 years	41	8.39	.83	9.00	6-9	<i>H</i> = 6.086(2); <i>p</i> =
> 81 years	46	8.13	1.15	9.00	5-9	.048
Gender	115	--	--	--	--	--
Female	91	8.41	.94	9.00	5-9	<i>U</i> = 1 193.5; <i>p</i> =
Male	24	8.17	1.13	9.00	5-9	.474
Educational level (in years)	115	--	--	--	--	--
0-2 years	48	8.10	1.17	9.00	5-9	<i>U</i> = 1 901.5; <i>p</i> =
3-4 years	67	8.54	.79	9.00	5-9	.057

Note: *M* = mean; *SD* = standard deviation; *Mdn* = median; *df* = degrees of freedom

Table 4. Multiple linear regression model for TNI-93 total score

Domain	Variable	B	SE B	B	T	p	Model	
							R^2	P
TNI-93 score							0.081	0.024
	Age	-0.025	0.011	-0.216	-2.221	0.028		
	Education	0.063	0.058	0.108	1.084	0.281		
	Gender	-0.383	0.227	-0.159	-1.688	0.094		

Note: R^2 = results variance; p = significance level

III. Conclusão

Este estudo apresentou uma validade convergente, moderadamente significativa, entre o TNI-93 e o ACE-III. Denotou-se que a idade é um preditor, apesar de não se ter verificado a mesma influência para o género ou nível de escolaridade nos resultados do TNI-93. A influência da idade e a ausência de diferenças entre os géneros estão de acordo com os estudos de Dessi et al. (2009) e Maillet et al. (2016). No estudo verificou-se que a ausência do nível de escolaridade não influenciou os resultados, efeito que não vai de encontro à literatura. Este facto pode ser justificado pela restrição da amostra, apresentando um nível de escolaridade baixo ou até inexistente ($M = 2,21$, intervalo = 0 - 4 anos), contrariamente aos estudos desses mesmos autores.

Nesta amostra a média do TNI-93 (8,36) é superior à média encontrada em outros estudos, como por exemplo, no estudo de Dessi et al. (2009) onde a média da amostra é inferior (2,97), porém obtivemos resultados similares ao estudo realizado por Maillet et al. (2016) nas duas amostras de idosos normais (8,4 e 8,7).

O ACE-III foi um dos testes utilizados no protocolo ao qual se verificou que a média dos resultados totais e seus domínios nesta amostra, mostraram-se inferiores às pontuações do estudo de Machado et al. (2005). Estas disparidades podem ser justificadas pelas diferentes constituições da amostra. Quero dizer com isto que no estudo de Machado et al (2005) a média de idade é de ($M = 70,41 \pm 7,96$) e a média de escolaridade ($M = 6,24 \pm 4,07$), enquanto que no nosso estudo a média de idade da amostra é superior ($M = 77,4 \pm 8,6$) e a média de escolaridade é inferior ($M = 2,21 \pm 1,7$).

Para além do teste (ACE-III) ter sido utilizado como ferramenta do protocolo, foi também um instrumento de correlação com o TNI-93, que comprovou ter validade convergente, moderadamente significativa.

Numa outra perspetiva, foi utilizada a GDS que no nosso estudo apresentou resultados médios mais elevados ($M = 11,48 \pm 6,5$) em relação ao estudo de Machado et al. (2015) ($M = 7,85 \pm 4,26$), facto que pode ser explicado pelas

dificuldades de interpretação das questões, relacionadas com o baixo nível de escolaridade.

Para avaliar a validade divergente, correlacionou-se o TNI-93 e a GDS, que mostrou ter uma validade divergente embora não se tenha denotado significativa, podendo estar relacionada com o tamanho e o nível educacional da nossa amostra.

Estes resultados permitiram a extração de uma equação normativa como forma de comparação entre o desempenho de um indivíduo e os resultados de nossa amostra, com base nos resultados esperados (de acordo com a idade) e no cálculo da pontuação z.

Concluimos que embora os nossos resultados devam ser analisados com precaução, isto porque é um estudo preliminar com limitações, nomeadamente, no que diz respeito ao tamanho da amostra e da mesma não ser aleatória, o TNI-93 prova ter uma validade convergente moderadamente significativa e ser um teste promissor independente de educação para o rastreio deterioração cognitiva/defeito cognitivo ligeiro/demência para a população idosa com iliteracia, iliteracia funcional ou baixo nível de escolaridade.

Este estudo vem realçar a necessidade de em estudos futuros ser considerada uma amostra aleatória e o tamanho da mesma; assim como estabelecer a sensibilidade, a especificidade, o poder preditivo positivo e negativo; e os pontos de corte do TNI-93 em contextos clínicos.

IV. Anexos

Anexo 1: Protocolo de investigação

Termo de consentimento informado

CONSENTIMENTO INFORMADO, ESCLARECIDO E LIVRE PARA PARTICIPAÇÃO EM ESTUDO DE INVESTIGAÇÃO

(de acordo com a Declaração de Helsínquia e a Convenção de Oviedo)

[Este documento representa uma forma de “contrato” entre investigador/a e participante, por isso cada parte fica com uma via assinada por ambos – o primeiro “outorgante” guarda-o para provar que pediu e obteve consentimento perante eventuais auditorias; o segundo “outorgante” guarda-o para reler, revogar se assim o entender ou reclamar se verificar eventual incumprimento do garantido.]

Por favor, leia/oiça com atenção a seguinte informação. Se achar que algo está incorreto ou que não está claro, não hesite em solicitar mais informações. Se concorda com a proposta que lhe foi feita, queira assinar este documento no final.

Título do estudo: “Aferição e normalização do *Test des Neuf Images (TNI)* numa amostra de idosos portugueses da região norte com baixa escolaridade ou iliteracia”

Enquadramento: O presente estudo está inserido na tese da aluna do curso de mestrado em Psicologia da Saúde e Neuropsicologia do Instituto Universitário de Ciências da Saúde (IUCS) **Marta Couto**, sob orientação do Prof. Doutor José Carlos Caldas.

O estudo integra uma colaboração com a equipa do Prof. Doutor Didier Mailet, Neurologista da *Unité fonctionnelle Mémoire et Maladies Neurodégénératives, Service de Neurologie, CHU Avicenne*, a Dr.^a Élia Baeta, Neurologista da Unidade Local de Saúde do Alto Minho, o Prof. Doutor Bruno Peixoto, Neuropsicólogo e o Prof. Doutor José Carlos Caldas, Psicólogo, ambos docentes do IUCS e investigadores do CINTESIS (Centro de Investigação em Tecnologias e Serviços de Saúde, Faculdade de Medicina, Universidade do Porto).

Explicação do estudo: Trata-se de um estudo que pretende fazer a adaptação e validação de uma bateria (conjunto) de testes neuropsicológicos para idosos iliteratos (analfabetos) e com baixo nível de escolaridade, para a população portuguesa.

Aos participantes será pedido para efetuarem um conjunto de testes neuropsicológicos, com duração total de cerca de uma hora, deslocando-se a investigadora à instituição frequentada pelo participante em horário a combinar.

Condições: A participação no estudo é voluntária, não havendo qualquer prejuízo para o participante em termos assistenciais, caso recuse participar.

Confidencialidade e anonimato: É assegurada a confidencialidade de todos os dados e seu uso exclusivo para o presente estudo, sendo mantidos anónimos os dados de identificação dos participantes.

Nome do investigador: _____

Contacto: Telemóvel _____

Assinatura: _____ **Data:** ___ / ___ / _____

Declaro ter compreendido as informações verbais que me foram fornecidas pela investigadora e ter-me sido garantida a possibilidade de, em qualquer altura, recusar participar no estudo sem qualquer tipo de consequências. Desta forma, aceito participar neste estudo e permito a utilização dos dados que de forma voluntária forneço, confiando em que apenas serão utilizados para esta investigação e nas garantias de confidencialidade e anonimato que me são dadas pelo/a investigador/a.

Nome do participante: _____

Assinatura: _____ **Data:** ___ / ___ / _____

SE NÃO FOR O PRÓPRIO A ASSINAR (POR IMPOSSIBILIDADE)

Nome de quem assina a rogo: _____

Grau de parentesco ou tipo de representação: _____

Assinatura _____ **Data:** ___ / ___ / _____

Dados Sociodemográficos

Data de Aplicação: __/__/____

Local: _____ Investigador: _____

Código de colheita: _____

Nome do Participante: _____

Data de Aplicação: __/__/____

Local: _____ Investigador: _____

Código de colheita: _____

Idade: _____ Género: M F

Escolaridade: _____; Profissão: _____; Atividade atual: _____;

Local de residência: _____; Estado Civil: Solteiro/Casado/Divorciado/Viúvo;

Agregado Familiar: Sozinho/Família/Institucionalizado. Esteve emigrado?

Sim/Não; Onde? _____; Quanto tempo (anos)? _____

Historial/Hábitos

Outras informações (limitações, patologias prévias ou atuais, terapêutica farmacológica):

Observações

Consumo de álcool (prévio/atual) _____/_____

Hábitos tabágicos (prévio/atual) _____/_____

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OBSERVAÇÕES:

Anexo 2: Comprovativo de submissão

Submission Confirmation

Thank you for your submission

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Anexo 3: Regras da submissão

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Reference

Stroup, D.F., Berlin, J.A., Morton, S.C., Olkin, I., Williamson, G.D., Rennie, D....Thacker, S.B. (2000). Meta-analysis of observational studies in epidemiology: a proposal for reporting. *Journal of the American Medical Association*, 283(15), 2008-2012.

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Structured Abstract

Keywords

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Methods

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Anexo 4: Comunicação oral

Comunicação oral apresentada à reunião da Secção de Neurologia do Comportamento no dia 14/11/2018 no Palace Hotel, Porto.



O Test des Neuf Images 93

estudo preliminar de validade e dados normativos numa amostra Portuguesa de idosos com iliteracia e baixa escolaridade

*Marta S. Couto **

*J. Carlos Caldas **

*** IUCS – Instituto Universitário de Ciências da Saúde*

*** IINFACTS – Instituto de Investigação e Formação Avançada em Ciências e Tecnologias da Saúde (membro integrado)*

** CINTESIS – Centro de Investigação em Tecnologias e Serviços de Saúde (membro colaborador)*

*Comunicação à Reunião da Secção de Neurologia do Comportamento
Palace Hotel, Porto
14/11/2018*

Background

- Desafio avaliação neuropsicológica - despiste deterioração cognitiva/ defeito cognitivo ligeiro/demência - ≥ 60 anos - iliteracia, iliteracia funcional ou nível baixo de escolaridade.

- Viés nos instrumentos comumente usados =>
 - Hiperestimar/ hiperdiagnosticar defeito cognitivo.

- Instrumentos comumente usados =>
 - Tarefas tipo “laboratório” ou “escolar”
 - Correlatos cognitivos iliteracia vs literacia mostra
 - Estratégias cognitivas qualitativamente diferentes
 - Diferenças funcionais e estruturais

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Background (cont.)

- Soluções propostas:
 - Adaptação testes:
 - Eliminação itens e subtestes
 - Normas específicas
 - Alteração normas aplicação - sessões de treino

 - Novos testes com > validade facial e ecológica

Nosso estudo => teste não-verbal; *screening* rápido defeito cognitivo ligeiro/demência; não implica “escolarização”; memória episódica de objetos comuns (evocação livre e com pistas) – não afetada pela escolaridade.

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Objetivo geral

Test des Neuf Images 93 (TNI-93)

- Validade convergente e divergente

- Dados normativos preliminares

- Efeitos idade, sexo, nível educacional

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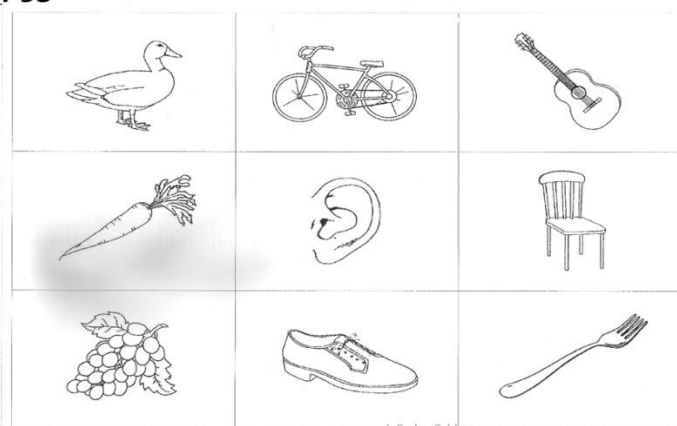
Método

- Amostra bola de neve (N = 115); idosos ≥ 60 anos; ambos sexos; sem queixas mnésicas; autónomos atividades de vida quotidiana.
- Instrumentos: **TNI-93, ACE III (Addenbrook's Examination III), GDS-30 (Geriatric Depression Scale)**
- Análises estatísticas
 - Correlações TNI-93/ACE III (validade convergente) e TNI-93/GDS (validade divergente)
 - Mann-Whitney U e Kruskal-Wallis (diferenças género, idade, escolaridade)
 - Regressão Linear Múltipla (modelo preditivo resultados TNI-93)

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TNI-93



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TNI-93

1ª Prova de Codificação

- 1.1. Com Imagens: nome animal, meio transporte... ..
- 1.2. Sem Imagens: nome animal, meio transporte... ..
- 1.3. Com imagens: itens em falta
- 1.4. Sem imagem: itens em falta: nome de... ..

2ª Prova Interferente (20"): contar para trás de 3 em 3 a partir 40 ou, dizer dias semana em ordem inversa (dom.º, sáb.º...)

3ª Recordação Livre

4ª Recordação com Pistas (só para imagens não recordadas)

RESULTADOS

Recordação Total = Recordação Livre + Recordação com pistas (Mínº. = 0; Máxº. = 9)

Intrusões = Intrusões na Codificação + Intrusões na Recordação Livre + Intrusões na Recordação com Pistas

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Resultados

Table 1. Demographic information

Descriptive Variables	N	Percentage	M	SD	Range
Age (years)	115	-	77.4	8.6	60-97
60-70 years	28	24.3	65.5		60-70
71-80 years	41	35.7	74.8		71-80
≥ 81 years	46	40.0	85.6		81-97
Gender	115				
Male	24	20.9			
Female	91	79.1			
Educational Level (years of schooling)	115		2.21	1.7	0-4
0-2 years	48	41.7	0.3		0-2
3-4 years	67	58.3	3.6		3-4
Residence	115				
Home	82	71.3			
Nursing Home	33	28.7			

Note: M = mean; SD = standard deviation

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Resultados

Table 2. Descriptive statistics and correlations between TNI-93, ACE-III and GDS

Tests scores	M (SD)	TNI-93	GDS
		r (p)	r (p)
ACE III	--	--	--
Total (Tt)	56.83 (15.1)	.381 (<.001)	-.412 (<.001)
Attention (Att)	12.82 (2.85)	.302 (.001)	-.261 (.005)
Memory (Mem)	13.55 (3.89)	.287 (.002)	-.259 (.005)
Fluency (Fl)	5.49 (3.13)	.347 (<.001)	-.405 (<.001)
Language (Lg)	16.55 (4.70)	.369 (<.001)	-.402 (<.001)
Visuo-spatial (VS)	8.43 (3.40)	.278 (.003)	-.383 (<.001)
TNI-93	8.36 (.98)	--	-.014 (.878)
GDS	11.48 (6.5)	--	--

Note: M = mean; SD = standard deviation; r = correlation; p = significance level

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Resultados

Table 3. Differences by age group, gender and educational level on TNI-93 total score (Kruskal-Wallis H and Mann-Whitney U)

	N	TNI-93 total score				H(df) / U; p
		M	SD	Mdn	Range	
Age Group (In years)	115	--	--	--	--	--
60-70 years	28	8.68	.82	9.00	5-9	
71-80 years	41	8.39	.83	9.00	6-9	H = 6.086(2); .048
> 81 years	46	8.13	1.15	9.00	5-9	
Gender	115	--	--	--	--	--
Female	91	8.41	.94	9.00	5-9	U = 1 193.5; .474
Male	24	8.17	1.13	9.00	5-9	
Educational level (In years)	115	--	--	--	--	--
0-2 years	48	8.10	1.17	9.00	5-9	U = 1 901.5; .057
3-4 years	67	8.54	.79	9.00	5-9	

Note: M = mean; SD = standard deviation; Mdn = median; df = degrees of freedom

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Resultados

Table 4. Multiple linear regression model for TNI-93 total score

Domain	Variable	B	SE B	β	T	p	Model
							R ²
							P
TNI-93 score							0.081
	Age	-0.025	0.011	-0.216	-2.221	0.028	
	Education	0.063	0.058	0.108	1.084	0.281	
	Gender	-0.383	0.227	-0.159	-1.688	0.094	

Note: R² = results variance; p = significance level

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Resultados

Modelo regressão linear => extração equação preditiva resultado esperado ($R_{esperado}$) TNI-93, atendendo idade

$$R_{esperado} = 10,393 - 0,026 \times \text{IDADE (em anos)}$$

e,

$$\text{Resultado } z = (R_{bruto} - R_{esperado})/DP$$

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DISCUSSÃO

Resultados médios TNI-93 (8.36) > que Dessi et al. (2009) (2,97) e semelhante a Maillat et al. (2016) (8.4 e 8.7).

Correlações TNI-93 / ACE-III (r .278 - .381) => validade convergente fraca mas significativa.

Correlações TNI-93 / GDS => não-significativas e baixas, não confirmam validade divergente => baixo nível escolaridade.

Resultados TNI-93 influenciados idade (Dessi et al. (2009) e Maillat et al. (2016)), mas **não escolaridade e sexo** => media anos escolaridade baixa ($M = 2.21$; Min 0 – Máx 4); e/ou teste "education free"].

Regressão linear múltipla => obtenção equação normativa baseada idade.

CONCLUSÃO: TNI-93 = teste promissor, "education-free", para avaliação breve de Déficit cognitivo ligeiro/Demencia em subpopulação de idosos com iliteracia ou baixa escolaridade.

ESTUDOS FUTUROS => avaliação Sensitividade/Especificidade/Poder preditivo positivo e negativo/ Ponto de corte, em contextos clínicos.

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Obrigado pela vossa atenção

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Anexo 5: Errata

Errata

- Na página 23, onde se lê “ (...) (varying between $r = .278$ to $.369$ and $p \leq .001$ to $.002$) ”, deve ler-se “ (...) (varying between $r = .278$ to $.369$ and $p \leq .001$ to $.003$) ”;

- Na página 36, onde se lê “ (...) mostraram-se inferiores às pontuações do estudo de Machado et al. (2005).”, deve ler-se “ (...) mostraram-se inferiores às pontuações do estudo de Machado et al. (2015).”;

- Na página 36, onde se lê “ (...) Quero dizer com isto que no estudo de Machado et al (2005) a média”, deve ler-se “ (...) Quero dizer com isto que no estudo de Machado et al (2015) a média”;