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Normative Values for 18-30 Age Group of Benton Visual Retention Test Scores and Pre-morbid Intelligence Quotients: New Data Comparisons for Diagnosing Memory and Visual Spatial Deficits in Alzheimer's Disease and Stroke

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Abstract

The Benton Visual Retention Test (BVRT) is a well known test used to assess visual memory deficits and visual spatial abilities in patients. Normative data for the 18-30 age group is not presently covered thoroughly; hence, this study continues the work of previous series that examined data comprising BVRT scores, intelligence quotients (IQ), anxiety and depression levels, and gender effects. Correlations between pre-morbid estimates of IQ across different BVRT administrations were examined and discussed in order to compile a database of new data comparisons for this age group.

Introduction

This study was further progression of previous series that examined the use of the Benton Visual Retention Test (BVRT) (Benton, 1974; Benton Sivan, 1992) for the assessment of visual memory functioning and visual spatial ability (see Thompson, Ennis, Coffin & Farman, 2007; Thompson & Gander, 2011). The aim of the study was to create a comprehensive database of normative data collected from using the BVRT in participants aged between 18 and 30 years old. Previously, no normative data existed for BVRT performance for this particular age group apart from that collected from the earlier series (Thompson & Gander, 2011) and the extensive data collected across all other age groups (Benton, 1946; Benton, Eslinger & Damasio, 1981). Data has been combined from this previous study in order to construct a comprehensive data set for reference by examiners of patients with a range of memory deficits.

The normative standard section of the BVRT manual states that performance on the three parallel administrations of the BVRT correlate substantially with intelligence level (Benton Sivan, 1992). Therefore, correlations were carried out across our data to determine comparisons.

The importance of the BVRT for particular clinical groups has been well established and documented elsewhere (Thompson, Ennis, Coffin & Farman, 2007; Thompson & Gander, 2011). In clinical settings the BVRT is often administered to determine the extent and type of visual spatial disability and visual memory deficit by way of categories of errors according to misplacement, substitution, omission, rotation, etc. This provides valuable information to the examiner especially if the patient has developed a stroke with a certain perceptual difficulty on one side of the body. It has also been a useful instrument in the neuropsychological assessment battery for the diagnosis and prognosis of Alzheimer?s disease (Thompson, 2006; 2011a,b).

Methods and Materials

Methods

Rationale

The aim of this study is to gain a set of normative data for performance on the BVRT for normal individuals aged between 18 and 30 years old.

Materials

Benton Visual Retention Test

The BVRT has 3 similar (parallel) forms of task C, D and E, each consisting of 10 designs containing one or more figures. In this study, 3 types of administration were used: A ? showing the images for 10 seconds then requiring immediate reproduction of the images from memory; B ? showing the images for 5 seconds followed by immediate reproduction; and C ? showing the images for 10 seconds, then delaying participants? reproduction of the figures after a further 15 seconds. Only two different versions were used: C and E. Therefore, these conditions were listed as: A(C), A(E), B(C), B(E), C(C) and C(E).

NART

In order to establish an estimate of pre-morbid IQ, the National Adult Reading Test (Nelson, 1992) is often administered. Benton Sivan (1992) shows BVRT scores together with pre-morbid IQs; hence, this study has collected similar data.

HADS

The Hospital Anxiety and Depression Scale (Snaith & Zigmond, 1994) was used to establish baseline anxiety and depression levels of each participant. It is known the high levels of anxiety and/or depression can affect memory functioning.

Experimental hypotheses

Based on previous experimental series, the following hypotheses were used:

H1 There will be a significant relationship between NART scores and Total Errors score and Total Correct scores on the BVRT.

H2 There will be a significant relationship between NART scores and Total Errors score and Total Correct scores across the three administrations A, B, C.

H3 There will be a significant relationship between Total Errors score and Total Correct scores on the BVRT and Anxiety and Depression scores on the HADS.

study design

In order to determine if age or gender had any significant influence on the data collected, a 3 x 2 unrelated ANOVA was implemented to investigate a significant difference in performance on the BVRT between genders and age groups. The first independent variable was gender, which had two levels, Males and Females. The second independent variable was age group, and was split into 3 levels, 18-20 (mode = 19, median = 19), 21-33 (mode = 21, median = 21), and 24-27 (mode 26, median = 26). The dependent variables were Total Errors score and Total Correct score.

Participants

Fifty undergraduate students attending Bournemouth University were recruited on a volunteer basis. Fourteen were male, 36 were female. Prior to the study, ethics approval was obtained from Bournemouth University Research & Ethics Committee (November 2009) and consent was obtained from each participant according to strict ethical guidelines.

Results

Statistics

Spearman's Rank Order correlation was used to determine the relationship between NART scores with Anxiety and also with Depression, as assessed by the HADS. No statistical evidence was found between these measures thus refuting H3 (NART plus Anxiety: $r = -.137$, $n = 53$, $p > .05$ two tailed; and NART plus Depression: $r = -.219$, $n = 53$, $p > .05$ two tailed).

No statistical evidence was found between the NART and Total Correct scores on administration A of the BVRT ($r = -.125$, $n = 53$, $p > .05$ two tailed) and also Total Errors scores ($r = .113$, $n = 53$, $p > .05$ two tailed). However, significant evidence of a negative correlation was found between the NART and BVRT Total Correct scores on administration B ($r = -.318$, $n = 53$, p

A significant positive correlation at .05 level was found between NART and BVRT Errors scores on administration B ($r = .318$, $n = 53$, $p < .05$ two tailed). A further positive correlation at .01 level was found between the NART and BVRT Errors scores on administration C ($r = .376$, $n = 53$, $p < .01$ one tailed) (Illustration 1).

A reasonable relationship between NART scores and BVRT Total Correct and Total Error scores on administration B (Illustrations 2 & 3) and administration C (Illustrations 4 & 5) were observed.

A table of statistical comparisons is presented showing support for H1 and H2 (Illustrations 6 & 7).

Discussion & Conclusions

The results obtained from this study support hypotheses H1 and H2 and refute H3. Hence, there are significant correlations between the NART scores and administrations of the BVRT. This allows researchers to refer to the database of correlations for the 18 ? 30 age group. It also allows clinicians to examine patients in these age ranges; previously, this test was constrained due to the lack of comprehensive data in this domain.

Clinical disorders span all age ranges; therefore, it is important to have normative data across the lifespan. By building a picture of abilities across ages, we are in a better position to judge whether or not the patient we are examining is performing below,? above or within their comparable age range. The picture of Alzheimer?s disease and vascular dementia is complicated (Thompson, 2002; Thompson, 2011c), and if we can make sense of people?s abilities across ages then we are better placed to understand the effects of diseases such as the dementias.

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Illustrations

Illustration 1

Spearmans rank order correlation between NART scores and BVRT Total Correct and Total Error scores on administrations A, B and C

	Rs	P
BVRT – A(C) and NART	-.125	.371
BVRT – A (E) and NART	.113	.420
BVRT – B(C) and NART	-.318	.020*
BVRT – B(E) and NART	.318	.020*
BVRT – C(C) and NART	-.325	.017*
BVRT – C(E) and NART	.376	.005**

*Correlation is significant at the 0.05 level (two-tailed)

**Correlation is significant at the 0.01 level (two tailed

Illustration 2

BVRT administration B(C) Total Correct scores and NART scores

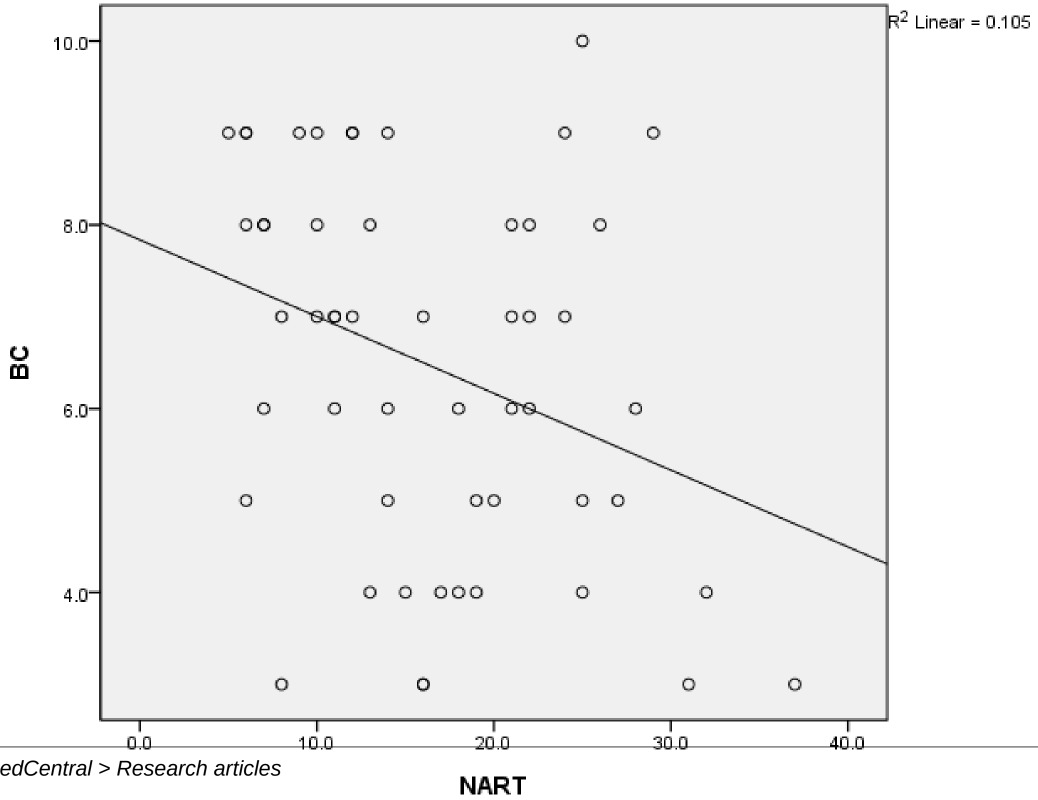

Illustration 3

BVRT administration B(E) Total Error scores and NART scores

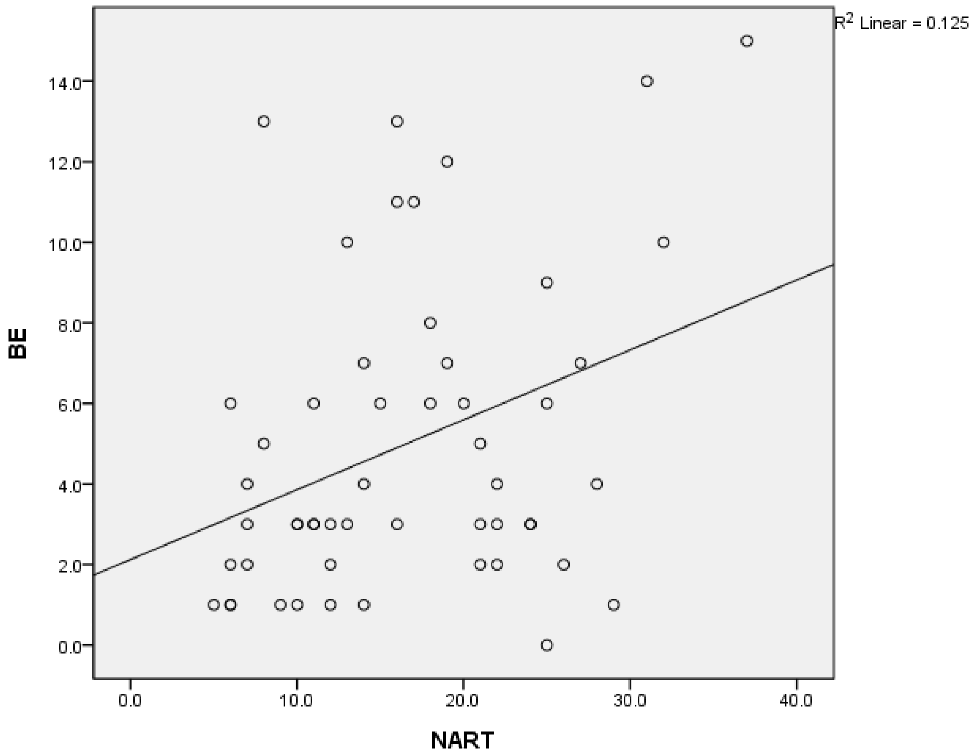

Illustration 4

BVRT administration C(C) Total Correct scores and NART scores

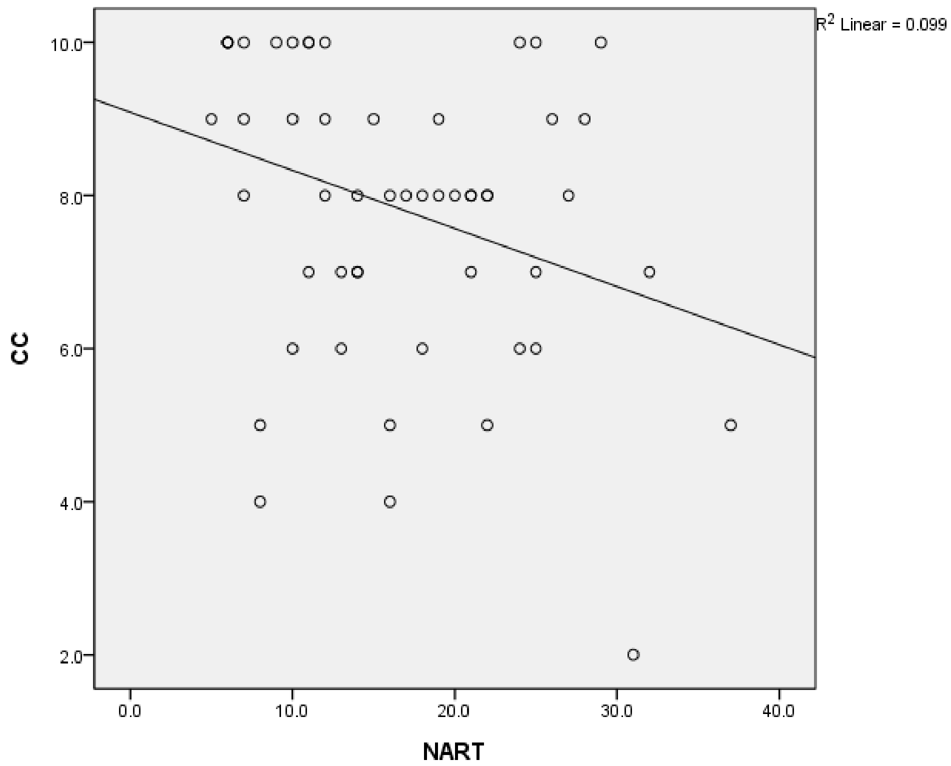

Illustration 5

BVRT administration C(E) Total Error scores and NART scores

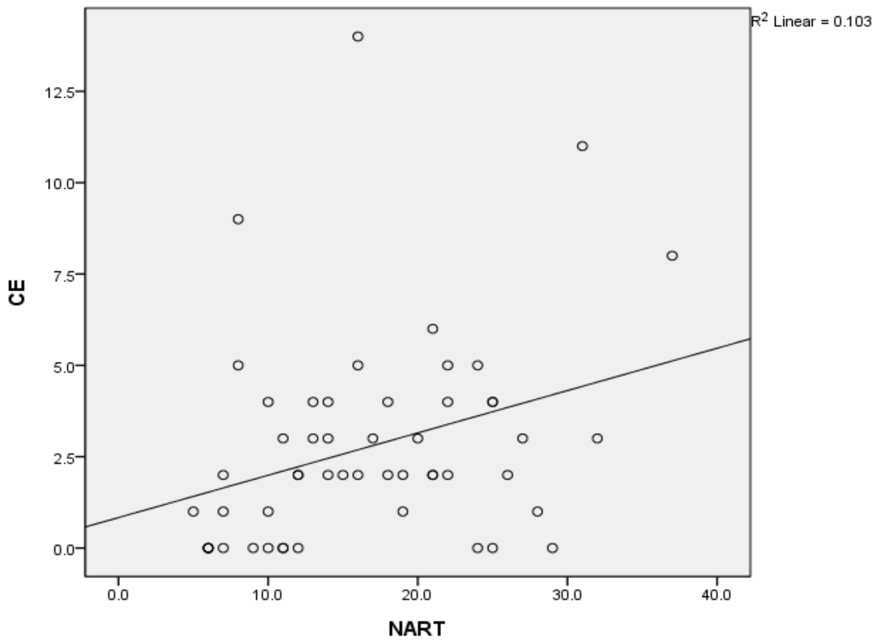

Illustration 6

Spearmans rank correlation across all measures

Correlations

			M/F	Anx	Dep	NART	A(C)	A(E)	B(C)	B(E)	C(C)	C(E)
Spearman's rho	M/F	Correlation Coefficient	1.000	.188	.246	-.253	.230	-.231	.187	-.141	.097	-.091
		Sig. (2-tailed)	.	.178	.075	.068	.098	.096	.181	.313	.489	.519
		N	53	53	53	53	53	53	53	53	53	53
	Anx	Correlation Coefficient	.188	1.000	.552**	-.137	-.219	.248	-.165	.157	-.169	.196
		Sig. (2-tailed)	.178	.	.000	.327	.116	.073	.239	.261	.226	.160
		N	53	53	53	53	53	53	53	53	53	53
	Dep	Correlation Coefficient	.246	.552**	1.000	-.219	-.154	.171	-.089	.103	.024	.018
		Sig. (2-tailed)	.075	.000	.	.116	.271	.220	.525	.465	.866	.897
		N	53	53	53	53	53	53	53	53	53	53
	NART	Correlation Coefficient	-.253	-.137	-.219	1.000	-.125	.113	-.318*	.318*	-.325*	.376**
		Sig. (2-tailed)	.068	.327	.116	.	.371	.420	.020	.020	.017	.005
		N	53	53	53	53	53	53	53	53	53	53
	A(C)	Correlation Coefficient	.230	-.219	-.154	-.125	1.000	-.945**	.466**	-.464**	.511**	-.432**
		Sig. (2-tailed)	.098	.116	.271	.371	.	.000	.000	.000	.000	.001
		N	53	53	53	53	53	53	53	53	53	53
	A(E)	Correlation Coefficient	-.231	.248	.171	.113	-.945**	1.000	-.457**	.443**	-.520**	.464**
		Sig. (2-tailed)	.096	.073	.220	.420	.000	.	.001	.001	.000	.000

Illustration 7

Spearmans rank correlation across all measures (continued)

CE	Correlation Coefficient	-.091	.196	.018	.376**	-.432**	.464**	-.512**	.499**	-.966**	1.000
	Sig. (2-tailed)	.519	.160	.897	.005	.001	.000	.000	.000	.000	.
	N	53	53	53	53	53	53	53	53	53	53

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Gender	53	1.0	2.0	1.547	.5025
Anxiety	53	1.0	19.0	7.698	4.2634
Depression	53	.0	18.0	4.113	3.4006
Valid N (listwise)	53				

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