

Right Hemisphere PICA Percentiles Revised

Bruce E. Porch
University of New Mexico and Veterans Administration Medical Center
Albuquerque, New Mexico

Phyllis M. Palmer
InSpeech, Inc., Albuquerque, New Mexico

During the last decade the "silent" right hemisphere has become quite verbal, and as far as many authors are concerned, very visible. Its role in normal linguistic processing has become the focus of many studies (for instance see: McLoughlin and McLoughlin, 1983; Wapner, Hamby and Gardner, 1981; Kim, Royer, Bonstelle, and Boller, 1980). Several writers have clearly demonstrated that right hemisphere damage does, in fact, result in language deficits that have previously been associated only with left hemisphere damage (Brust, Plank, and Burke, 1982; Lebrun, 1980). Meyers, at the 1978 CAC meeting, advised us that the clinical aphasiologist would be expected to become increasingly involved with right hemisphere damaged patients; so, in 1979, Deal et al., feeling that there was a lack of tests with adequate right hemisphere norms, offered normative data for the Porch Index of Communicative Ability (PICA, Porch, 1973).

After a few years of experience using these norms, a replication study seemed advisable for several reasons. First, Deal et al. failed to provide a description of the sample they used to assure the clinician that it was a heterogeneous, random sample of subjects. Secondly, their study was performed prior to the adoption of the ten modalities used to replace the four old modalities; therefore, these 1979 norms do not provide adequate information for present PICA forms and interpretation. In addition, the four modality scores (overall, gestural, verbal and graphic) were computed from data on 111 patients, while the subtest norms were derived from data on only 96 patients. This raises the possibility that there could be a mismatch between the modality and subtest percentiles. Thirdly, diacritical markers presently being used in scoring which may be more sensitive to right hemisphere symptoms, and a more accurate reflection of right hemisphere characteristics, were not widely used prior to 1979. Finally, during the five years using the Deal et al. norms it appeared that they were somewhat high. This would have the effect of lowering the percentiles. Clinically, a patient with minor deficits would be described as being at a low percentile level and more impaired than his actual symptoms suggest.

With these issues in mind, a study was initiated 1) to replicate the Deal et al. study in order to verify the accuracy of their norms or to recommend appropriate changes, and 2) to provide right hemisphere norms for the currently used ten modalities instead of four.

METHOD

PICA test data on 94 right hemisphere damaged patients were collected over a three-year period. All tests were administered under standard test conditions by clinicians of verified scoring reliability exceeding 80% accuracy on the PICA reliability tape. The 94 patients included 92 males and two females. In terms of handedness, 92 were right-handed and two were left-handed. The etiologies for the right hemisphere damage were 72 CVAs, 11

aneurysms, 6 closed head traumas, and 5 open head traumas. The mean age was 56.37 with a range of 22 to 90 years. The mean education was 11.4 years with a range of 0 to 21 years. The date of the first PICA administered ranged from 1 to 312 weeks post-onset with a mean of 21 weeks post-onset. Patients with complicating medical or psychiatric problems were excluded.

RESULTS

The modality means for the 94 patients are shown in Table 1. As expected, these norms are lower than those for non-brain-damaged subjects (Duffy, et al., 1976) and higher than patients with left hemisphere lesions (Porch, 1981). Table 2 shows the subtest percentiles. As you can see, some patients with massive right hemisphere lesions can have quite marked depressions of their communicative abilities. Another observation is that when patients are mildly involved they achieve all 15's on the visual and auditory tasks, but below the 50th percentile there is usually a visual-auditory reversal, an expected finding, since visual processing and spatial perception have been well localized to the right hemisphere where the lesions were located.

Turning to the comparison of the Deal et al. norms and the present data, Figure 1 shows means plotted on a marked response graph. In terms of how each set of data describe the right hemisphere damaged patient, both profiles have similar peaks and depressions. Both sets of data show the typical symptoms of high verbal ability, marked difficulty with subtests E and F, and visual-auditory reversal. However the Deal et al. data are about a full step higher than the Porch-Palmer data. Although this may not seem to be a major difference it takes on greater significance if we look at percentile levels.

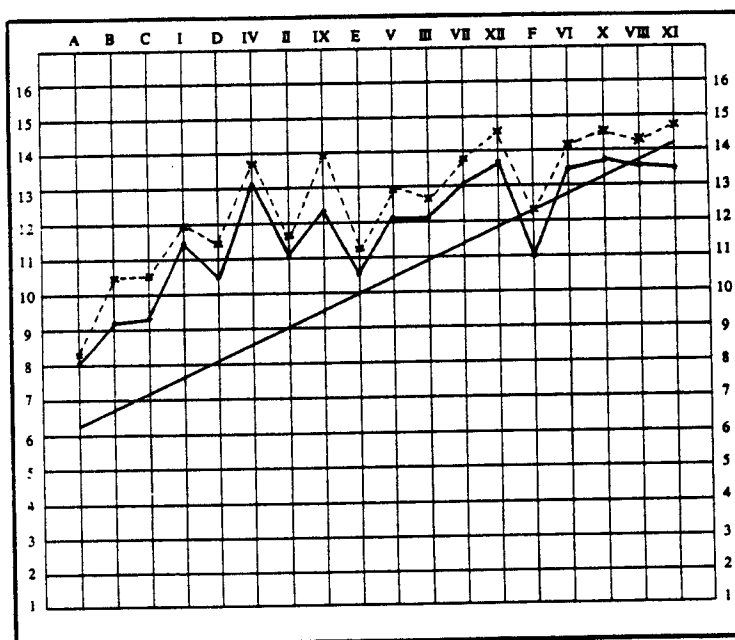


Figure 1. Comparison of subtest means between Deal et al. (---x---) and Porch-Palmer (-----).

Percentiles	Overall	Writing	Copying	Reading	Pantomime	Verbal	Auditory	Visual	Gestural	Graphic
99	14.89	14.90	14.88	15.00	14.91	14.89	15.00	15.00	14.90	14.90
95	14.22	13.80	14.35	15.00	13.90	14.73	15.00	15.00	14.71	13.80
90	13.99	13.21	14.05	15.00	13.62	14.59	15.00	15.00	14.62	13.29
85	13.82	12.79	13.80	14.89	13.41	14.48	15.00	15.00	14.53	12.92
80	13.64	12.37	13.51	14.78	13.24	14.36	15.00	15.00	14.45	12.59
75	13.47	11.94	13.29	14.68	13.10	14.24	15.00	15.00	14.36	12.31
70	13.29	11.52	12.83	14.55	13.00	14.11	14.98	15.00	14.28	11.82
65	13.12	11.10	12.46	14.48	12.83	14.01	14.90	15.00	14.20	11.47
60	12.95	10.66	12.10	14.35	12.69	13.92	14.87	15.00	14.11	11.04
55	12.78	10.24	11.70	14.25	12.49	13.83	14.82	15.00	14.02	10.71
50	12.60	9.82	11.30	14.10	12.29	13.73	14.80	14.89	13.95	10.33
45	12.42	9.36	10.89	13.92	12.04	13.61	14.72	14.80	13.85	9.97
40	12.34	8.90	10.50	13.70	11.80	13.45	14.66	14.70	13.73	9.59
35	11.97	8.42	10.04	13.46	11.47	13.22	14.56	14.53	13.55	9.12
30	11.68	7.97	9.69	13.15	11.06	12.91	14.43	14.37	13.36	8.67
25	11.32	7.50	9.28	12.72	10.65	12.56	14.15	14.19	13.08	8.20
20	10.91	7.01	8.76	11.71	10.10	12.12	13.60	13.94	12.50	7.70
15	10.35	6.41	8.12	10.20	9.51	11.35	12.78	13.35	11.41	7.14
10	9.33	5.63	7.33	7.90	8.88	10.30	11.30	11.56	10.15	6.38
5	7.82	4.60	6.30	5.10	7.85	8.60	8.71	8.00	8.64	5.39
1	6.11	3.00	3.80	3.00	3.00	6.63	6.20	6.12	7.08	4.75
<hr/>										
x	12.10	9.69	11.04	12.94	11.76	13.04	13.94	13.99	13.17	10.12
SD	2.10	2.91	2.64	2.88	1.99	2.05	2.07	2.17	2.04	2.70

Table 2. Right Hemisphere PICA Subtest Percentiles.(N = 94)

Percentile	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	A	B	C	D	E	F
99	14.8	14.9	14.9	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	14.0	15.0	15.0	15.0	15.0	14.7
95	14.6	13.9	14.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	12.7	14.2	14.4	14.7	14.7	14.2
90	14.3	13.4	14.3	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	11.8	13.7	13.9	14.4	14.4	13.8
85	14.1	13.1	14.0	14.9	14.8	15.0	15.0	15.0	14.8	15.0	15.0	15.0	11.1	13.2	13.4	14.0	14.1	13.4
80	13.8	12.9	13.8	14.8	14.7	15.0	15.0	15.0	14.7	15.0	15.0	15.0	10.4	12.7	13.0	13.6	13.8	13.1
75	13.5	12.6	13.6	14.7	14.6	15.0	15.0	15.0	14.6	15.0	15.0	15.0	9.8	12.2	12.5	13.2	13.4	12.8
70	13.1	12.4	13.4	14.6	14.4	15.0	15.0	15.0	14.5	15.0	15.0	15.0	9.4	11.7	12.1	12.8	13.0	12.5
65	12.8	12.2	13.2	14.5	14.2	15.0	15.0	15.0	14.4	15.0	15.0	15.0	8.9	11.2	11.6	12.4	12.6	12.3
60	12.6	12.0	13.0	14.4	14.0	15.0	14.9	15.0	14.3	15.0	15.0	15.0	8.5	10.7	11.1	11.9	12.1	12.1
55	12.2	11.8	12.9	14.3	13.8	14.8	14.8	14.8	14.2	14.9	15.0	14.9	8.1	10.2	10.6	11.5	11.7	11.9
50	11.9	11.6	12.7	14.0	13.6	14.8	14.7	14.7	14.0	14.8	15.0	14.7	7.8	9.7	10.1	11.1	11.2	11.7
45	11.6	11.3	12.5	13.8	13.4	14.8	14.5	14.6	13.8	14.7	15.0	14.6	7.5	9.2	9.7	10.7	10.7	11.5
40	11.3	11.0	12.4	13.6	13.0	14.8	14.3	14.4	13.6	14.6	14.8	14.4	7.2	8.7	9.2	10.3	10.1	11.2
35	11.0	10.6	12.0	13.3	12.5	14.6	14.1	14.2	13.4	14.5	14.7	14.2	6.8	8.2	8.6	9.8	9.5	10.8
30	10.7	10.2	11.7	12.9	11.9	14.3	13.8	14.1	13.1	14.3	14.5	13.9	6.4	7.8	7.9	9.3	8.8	10.4
25	10.3	9.6	11.3	12.4	11.2	13.8	13.3	13.8	12.7	14.0	14.3	13.5	6.0	7.2	7.2	8.7	8.2	9.9
20	9.8	9.1	10.9	11.8	10.3	13.2	12.5	13.5	12.2	13.6	13.9	13.3	5.6	6.6	6.5	7.7	7.5	9.3
15	9.1	8.6	10.2	11.0	9.3	12.0	10.8	13.1	11.4	13.0	12.6	12.9	5.3	5.8	5.8	6.6	6.8	8.4
10	8.2	7.9	9.4	10.0	6.5	10.6	7.9	10.9	9.8	11.4	9.8	11.7	4.8	5.0	5.1	5.5	5.9	7.3
5	7.0	7.1	8.2	8.0	5.0	6.2	4.3	7.5	7.5	7.8	6.0	8.3	4.1	4.2	4.2	4.4	4.9	5.5
1	5.5	5.4	6.6	7.1	3.0	5.0	4.0	4.8	5.2	6.2	3.1	7.0	3.8	4.0	3.0	4.0	4.2	4.2
<hr/>																		
x	11.60	11.08	12.24	13.14	12.41	13.74	13.28	13.76	13.20	13.94	13.77	13.84	8.12	9.66	9.81	10.65	10.51	11.08
SD	2.41	2.26	2.02	2.38	3.07	2.55	2.97	2.43	2.36	2.10	2.90	2.16	2.65	3.12	3.34	3.22	3.31	2.54

Table 3 shows a comparison of the Porch-Palmer scores at half decile steps and the Deal et al. percentiles that are equivalent to those scores. The differences between the two sets of norms are shown on the right. This table shows how the higher Deal et al. norms effectively lower percentile levels. Relatively small deficits result in marked depressions of percentile levels. As Table 3 shows, the Deal et al. percentiles average over 10 percentile points lower than the Porch-Palmer norms and exceed 15 percentile points above the 50th percentile. Below the 30th percentile the differences are less than 10 percentile points.

Table 3. The Porch-Palmer half decile levels compared with the Deal et al. right hemisphere norms.

OA Score	OA Percentiles		Difference
	Porch & Palmer	Deal et al.	
14.89	99	99	0
14.22	95	82	13
13.99	90	74	16
13.82	85	69	16
13.64	80	63	17
13.47	75	57	18
13.29	70	53	17
13.12	65	48	17
12.95	60	44	16
12.78	55	40	15
12.60	50	37	13
12.42	45	33	12
12.34	40	30	10
11.97	35	25	10
11.68	30	22	8
11.32	25	18	7
10.91	20	17	3
10.35	15	11	4
9.33	10	5	5
7.82	5	3	2
6.11	1	1	0

DISCUSSION

Deal et al. pointed out in their discussion that a replication study needed to be done to verify their findings, and this paper reports the results of such a study. As they discovered, right hemisphere damaged patients do have communication deficits, and, in fact, our data show about a full step of deficit more than the Deal et al. norms. Consequently, for clinicians who are uneasy about small deficits producing large depressions in percentile levels, the new norms will be more comfortable. These norms represent a compilation of carefully administered, accurately scored tests

DISCUSSION

Q: Why should we give the PICA to right hemisphere damaged patients?

A: The PICA is a standard measure for left, bilateral and right hemisphere dysfunction. Using PICA profiles and localization criteria allows us to sort out right, left and bilaterally involved patients. Now once identified as right hemisphere involved, the proper norms can be utilized. Also, by providing normative data for each group, clinicians can compare function across groups.

Q: What is meant by a 'full step'?

A: If you think of the PICA as a 15-step scoring system, one step would be the distance between any consecutive digits.

Q: Does diacritical scoring affect the total scores?

A: Yes, it allows us to be more sensitive to the severe distortions caused by spatial disorientation. It may be that prior to the use of diacritics these bizarre behaviors were identified as 14s, whereas now they are identified as 12s.

C: It is a little early to be talking about norms when there is tremendous variability in right hemisphere damaged patients. We may need more patients if we are going to have norms. We may need to ask ourselves if these norms are needed. If you drew another sample of 100 patients, you are not going to get the same results that you have reported here.

REBUTTAL: We started generating these percentiles after 50 patients and 75 and then 90 patients. The data don't fluctuate that much once you get past 50 patients. It starts stabilizing. I suspect that it is not just random fluctuation. There is something orderly here, but we certainly need to explore it more.

C: I'm somewhat sympathetic to the concern about for what purpose we might want to give the PICA for right hemisphere damaged patients. However, I can imagine some situations where if we wanted to ask a particular question about the nature of a right hemisphere damaged person's problem, we might want to use the test as a means of simply looking at the basic language abilities of a right hemisphere damaged person. Perhaps we might want to find out where they might fall on the percentile scale and compare right hemisphere people on some figurative task--those that are above the 50th percentile versus those below it.