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What is This?

FREQUENCY OF VERBAL AND PERFORMANCE IQ DISCREPANCIES ON THE WPPSI-R AT VARIOUS LEVELS OF ABILITY

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The issue of Verbal-Performance IQ discrepancy has been investigated with the Wechsler Preschool and Primary Scale of Intelligence (Wechsler, 1967) and, given the recent revision of this scale (WPPSI-R; Wechsler, 1989), determining the average expectable scatter would be useful for the clinician. The present study examined the incidence of VIQ-PIQ discrepancies and subtest variation by ability level in the standardization sample of the WPPSI-R. Cumulative frequency distributions were constructed for the overall sample of 1,700 children and for five ability levels (≤ 79, 80-89, 90-109, 110-119, and 120 +) within this sample. The average PIQ $>$ VIQ was 11.54 points (SD = 9.10) and the average VIQ $>$ PIQ was 10.69 (SD = 7.87). The average difference tended to increase with ability level. Subtest scatter also was examined and found to increase with ability level. These results are consistent with previous studies on both the WPPSI and the WISC-R.

The issue of Verbal-Performance IQ discrepancy on the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler, 1981), the Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1972), and the Wechsler Preschool and Primary Scale of Intelligence (WPPSI; Wechsler, 1967) has received a great deal of attention. Investigators have examined VIQ-PIQ discrepancies by level of education (Bornstein, Suga, & Prifitera, 1987; Matarazzo & Herman, 1984); gender (Matarazzo, Bornstein, McDermott, & Noonan, 1986); occupation of child's parents (Kaufman, 1976a); child's diagnostic classification (e.g., Anderson, Kaufman, & Kaufman, 1976; Hagin, Silver, & Corwin, 1971); and IQ level (Spitz, 1989). These numerous studies have proven extremely useful to the clinician who is interpreting the WPPSI, WISC-R, and the WAIS-R.

In addition to investigating the discrepancy between the VIQ and PIQ, there also have been a number of investigations of the amount of variation that can be expected within each of these individual scales. For example, Kaufman (1976b) used the standardization sample for the WISC-R to examine the average size of the difference between the highest and lowest subtest scaled scores for the Verbal, Performance, and Full Scales. He found that the average difference was 5.3 points for the Verbal Scale, 6.1 points for the Performance Scale, and 7.7 points for the Full Scale. A similar study was conducted by Reynolds and Gutkin (1981) with the

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standardization sample of the WPPSI. These authors obtained mean ranges of scatter of 5.2, 5.2, and 6.9 points for the Verbal, Performance, and Full Scales, respectively.

Given the recent publication of the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R; Wechsler, 1989) and the relative lack of information available on interpreting its predecessor, the WPPSI, information on WPPSI-R VIQ-PIQ discrepancies and subtest variation would be useful to the clinician. The present study examined the incidence of VIQ-PIQ discrepancies and subtest variation by ability level in the standardization sample of the WPPSI-R.

METHOD

Subjects

The WPPSI-R standardization sample, tested between 1987 and 1989, was used in this study. This sample, described in detail in the manual (Wechsler, 1989), consisted of 1,700 children stratified by age, ethnicity, sex, geographic region, and parent's occupation and education. This sample closely matches the preschool population in the United States according to the 1986 U.S. Census Bureau data (Bureau of the Census, 1986). Children with known brain damage, severe emotional or behavioral disturbances, physical handicaps that would interfere with their test performance, or children institutionalized for mental deficiency were not included in this sample.

Procedure and Results

The 1,700 subjects were divided into five ability levels: FSIQ $\leq$ 79 ($n = 142$), 80-89 ($n = 268$), 90-109 ($n = 839$), 110-119 ($n = 295$), and 120 + ($n = 156$). The observed incidence of VIQ $\neq$ PIQ of various magnitudes was computed for each of the five ability levels, and a frequency distribution of these discrepancies was constructed (Table 1). Across all ability levels, the average VIQ-PIQ discrepancy was 10.81 points with a standard deviation of 8.57 points. The mean discrepancy and the standard deviation of that discrepancy tended to increase from low to high ability levels.

In addition to ascertaining the absolute magnitude of the VIQ-PIQ discrepancy, the direction of discrepancy (PIQ > VIQ vs. VIQ > PIQ) also was examined by ability level. Table 2 presents the frequency distributions of PIQ > VIQ and VIQ > PIQ for the five ability levels. In this table, the discrepancies are presented as ranges. The size of the ranges from 11 through 41 + corresponds to increments of one standard deviation ($M = 10.82$). Across all five ability levels the average PIQ > VIQ discrepancy was 11.54 points ($SD = 9.10$) and the average VIQ > PIQ was 10.69 ($SD = 7.87$). It is interesting to note that across all ability levels the average PIQ > VIQ discrepancy was larger than the average VIQ > PIQ discrepancy.

Subtest scatter can be calculated in several ways. (For a complete discussion of the merits of these various methods, see Matarazzo, Daniel, Prifitera, & Herman 1988). For the purpose of this study, due to its practical application for clinicians and its high correlation with the standard deviation method, subtest scatter was calculated by the range method, which requires subtracting the lowest subtest scores from the highest subtest scores. Separate frequency distributions were constructed for range by ability level for the 6 Verbal subtests, the 6 Performance subtests, and the 12

Table 1
Percentage of Cases at or above Each Level of PIQ-VIQ Discrepancy in the WPPSI-R Standardization Sample

PIQ-VIQ discrepancies	Full Scale IQ					
	≤79	80-89	90-109	110-119	120+	All
40	.0%	.4%	.5%	1.0%	1.3%	.6%
39	.0	.4	.6	1.0	1.3	.6
38	.0	.7	1.0	1.4	1.3	.9
37	.0	1.1	1.0	1.4	1.3	1.0
36	.0	1.1	1.3	1.7	1.3	1.2
35	.5	1.1	1.7	1.7	3.2	1.6
34	.0	1.5	1.8	1.7	3.2	1.7
33	.0	1.9	2.5	2.4	3.8	2.3
32	.0	2.2	3.0	3.1	3.8	2.7
31	.0	3.0	3.1	3.4	3.8	2.9
30	.7	3.0	3.7	3.7	4.5	3.4
29	1.4	3.4	4.3	4.7	5.8	4.1
28	1.4	3.7	5.6	5.4	6.4	5.0
27	1.4	3.7	6.2	6.1	8.3	5.6
26	2.8	4.1	6.9	7.5	9.0	6.4
25	2.8	4.1	8.1	8.5	9.0	7.2
24	3.5	5.2	8.8	10.5	12.2	8.4
23	3.5	6.0	10.1	11.5	13.5	9.5
22	4.2	7.5	11.7	12.5	14.7	10.8
21	4.9	9.7	13.9	15.6	15.4	12.9
20	5.6	10.8	15.6	19.7	17.3	14.9
19	7.0	13.8	18.2	20.3	17.9	16.9
18	9.9	16.0	21.5	22.7	20.5	19.8
17	16.2	18.7	23.8	24.7	23.1	22.5
16	18.3	20.9	27.2	26.4	25.0	25.1
15	21.1	23.9	29.4	29.8	31.4	28.1
14	24.6	26.9	32.2	33.6	33.3	31.1
13	28.9	28.4	36.2	39.0	36.5	34.9
12	31.0	31.3	39.2	43.1	39.7	38.0
11	36.6	37.3	43.5	46.4	42.9	42.4
10	41.5	40.7	47.9	52.9	44.9	46.8
9	45.8	46.6	52.8	58.6	52.6	52.2
8	50.7	51.9	56.7	64.7	57.7	56.9
7	54.9	57.1	62.5	69.8	61.5	62.2
6	62.0	63.4	67.3	74.9	67.3	67.6
5	67.6	71.3	72.8	81.4	71.8	73.5
4	73.2	75.7	78.4	85.1	79.5	78.8
3	83.8	82.8	84.6	90.8	87.2	85.6
2	90.8	89.9	91.9	93.9	96.2	91.8
1	95.8	97.8	97.3	98.0	98.1	97.4
0	100.0	100.0	100.0	100.0	100.0	100.0
N	142	268	839	295	156	1700
M	8.92	9.76	10.98	11.89	11.42	10.81
SD	6.61	8.17	8.68	8.67	9.56	8.57
Median	8.0	8.0	9.0	10.0	9.0	9.0

combined Verbal and Performance subtests (Tables 3, 4, and 5, respectively). Separate frequency distributions also were constructed for range by ability level for the 5 required Verbal subtests, the 5 required Performance subtests, and the

Table 2
Full Scale PIQ-VIQ Discrepancies by Direction and Ability Level in the WPPSI-R Standardization Sample

PIQ - VIQ discrepancies		Full Scale IQ											
		≤79		80-89		90-109		110-119		120+		All	
		PIQ>VIQ	VIQ>PIQ	PIQ>VIQ	VIQ>PIQ	PIQ>VIQ	VIQ>PIQ	PIQ>VIQ	VIQ>PIQ	PIQ>VIQ	VIQ>PIQ	PIQ>VIQ	VIQ>PIQ
≥41[a]	N	—	—	1	—	3	1	2	1	2	—	8	2
	Col. %	—	—	.7	—	.8	.2	1.4	.7	3.1	—	1.0	.2
31-40[a]	N	—	—	4	3	16	6	6	1	1	3	27	13
	Col. %	—	—	3.0	2.4	4.1	1.4	4.3	.7	1.6	3.4	3.4	1.5
21-30[a]	N	4	3	10	8	35	56	18	18	8	10	75	95
	Col. %	5.9	4.4	7.4	6.3	8.9	13.3	12.8	12.2	12.5	11.2	9.3	11.1
11-20[a]	N	24	21	41	33	125	123	45	46	15	28	250	251
	Col. %	35.3	30.9	30.4	26.0	31.6	29.2	31.9	31.1	23.4	31.5	31.1	29.4
5-10	N	18	18	33	37	98	102	43	41	17	21	209	219
	Col. %	26.5	26.5	24.4	29.1	24.8	24.2	30.5	27.7	26.6	23.6	26.0	25.7
1-5	N	22	26	46	46	118	133	27	41	21	27	234	273
	Col. %	32.4	38.2	34.1	36.2	29.9	31.6	19.1	27.7	32.8	30.3	29.1	32.0
N		68	68	135	127	395	421	141	148	64	89	803	853
M		9.75	8.88	10.53	9.42	11.61	10.99	13.03	11.28	11.86	11.49	11.54	10.69
SD		6.48	6.50	8.87	7.24	9.14	8.07	9.28	7.81	10.81	8.52	9.10	7.87
Median		9.0	9.0	9.0	7.0	10.0	9.0	11.0	9.5	9.0	9.0	9.0	9.0

[a]These discrepancies represent increments of one standard deviation from the mean discrepancy (*M* = 10.82).

Table 3
Verbal Scale (Six Subtests) Percentage of Cases at or above Each Level of Scatter in the WPPSI-R Standard-ization Sample

Scatter (range)	Verbal IQ					
	$\leq$79	80-89	90-109	110-119	120 +	All
13	.0%	.0%	.0%	.0%	.0%	.0%
12	.7	.0	.2	.3	.0	.2
11	.7	.4	.7	1.3	1.3	.8
10	2.1	.8	2.3	3.6	1.9	2.3
9	2.8	3.2	5.8	5.6	4.5	5.1
8	5.7	7.7	10.9	11.5	13.6	10.5
7	12.1	15.4	19.7	21.7	29.2	19.8
6	25.0	30.8	34.0	41.4	50.6	35.7
5	44.3	49.5	55.2	65.3	70.7	56.8
4	62.9	71.5	78.6	84.3	88.9	78.3
3	90.8	90.2	92.9	96.1	96.0	93.2
2	97.9	98.3	99.1	99.4	100.0	99.0
1	99.3	99.5	100.0	100.0	100.0	99.9
0	100.0	100.0	100.0	100.0	100.0	100.0
N	140	246	855	305	154	1700
M	4.44	4.68	5.00	5.30	5.57	5.01
SD	1.88	1.85	1.93	1.88	1.79	1.91
Median	4.0	4.0	5.0	5.0	6.0	5.0

Table 4
Performance Scale (Six Subtests) Percentage of Cases at or above Each Level of Scatter in the WPPSI-R Standardization Sample

Scatter (range)	Performance IQ					
	$\leq$79	80-89	90-109	110-119	120 +	All
15	.0%	.0%	.0%	.0%	.0%	.0%
14	.0	.0	.0	.0	1.2	.1
13	.7	.4	.5	.7	1.2	.6
12	2.1	1.2	1.5	1.4	1.8	1.5
11	2.8	2.7	2.6	2.5	3.0	2.6
10	3.5	5.3	5.2	5.7	7.1	5.3
9	7.7	10.2	10.8	12.0	12.4	10.8
8	16.2	18.9	20.6	21.8	21.8	20.3
7	33.1	32.9	34.1	35.5	36.4	34.3
6	50.0	48.0	54.1	54.8	55.7	53.1
5	69.7	68.8	72.0	78.0	73.8	72.5
4	84.5	83.9	86.1	90.3	87.8	86.5
3	96.5	96.0	95.8	98.4	98.3	96.6
2	99.3	99.8	99.7	99.8	99.5	99.7
1	100.0	100.0	100.0	100.0	100.0	100.0
0	100.0	100.0	100.0	100.0	100.0	100.0
N	142	265	837	285	171	1700
M	5.66	5.67	5.82	6.00	5.99	5.83
SD	2.11	2.17	2.15	2.06	2.22	2.14
Median	5.5	5.0	6.0	6.0	6.0	6.0

Table 5
Full Scale (12 Subtests) Percentage of Cases at or above Each Level of Scatter in the WPPSI-R Standard-ization Sample

Scatter (range)	Full Scale IQ					
	≤79	80-89	90-109	110-119	120 +	All
16	.0%	.0%	.0%	.0%	.0%	.0%
15	.0	.0	.1	.0	.6	.1
14	.0	.7	.6	.3	1.2	.6
13	.7	1.4	2.3	1.3	1.8	1.8
12	2.1	3.3	4.4	4.7	4.4	4.1
11	2.8	6.7	9.2	9.1	7.0	8.0
10	4.9	13.0	17.1	16.9	16.0	15.2
9	16.9	23.4	29.4	30.1	27.5	27.3
8	31.7	39.4	46.8	45.0	48.7	44.2
7	54.2	58.8	66.3	70.8	68.6	65.1
6	76.0	79.7	82.9	86.4	87.2	82.8
5	91.5	93.5	95.7	97.6	97.5	95.4
4	95.7	99.1	99.6	100.0	99.4	99.2
3	100.0	100.0	100.0	100.0	100.0	100.0
2	100.0	100.0	100.0	100.0	100.0	100.0
1	100.0	100.0	100.0	100.0	100.0	100.0
0	100.0	100.0	100.0	100.0	100.0	100.0
N	142	268	839	295	156	1700
M	6.77	7.20	7.54	7.63	7.60	7.44
SD	1.84	2.04	2.10	1.97	2.00	2.05
Median	7.0	7.0	7.0	7.0	7.0	7.0

Table 6
Verbal Scale (Five Subtests) Percentage of Cases at or above Each Level of Scatter in the WPPSI-R Standard-ization Sample

Scatter (range)	Verbal IQ					
	≤79	80-89	90-109	110-119	120 +	All
13	.0%	.0%	.0%	.0%	.0%	.0%
12	.7	.0	.2	.0	.0	.2
11	.7	.4	.6	.3	.0	.5
10	1.4	.8	1.8	.6	.6	1.3
9	1.4	2.8	4.0	1.9	2.5	3.1
8	2.1	5.6	8.3	6.8	7.0	7.0
7	5.7	10.5	16.0	15.7	20.0	14.6
6	12.8	20.7	26.5	31.8	36.9	26.4
5	32.1	37.8	46.0	53.1	53.8	45.6
4	53.5	65.0	68.9	73.4	78.5	68.7
3	84.9	82.5	87.7	89.8	92.1	87.5
2	95.6	95.9	97.8	97.7	98.6	97.4
1	99.2	99.6	100.0	99.7	100.0	99.8
0	100.0	100.0	100.0	100.0	100.0	100.0
N	140	246	855	305	154	1700
M	3.91	4.22	4.58	4.71	4.91	4.53
SD	1.68	1.84	1.94	1.81	1.78	1.88
Median	4.0	4.0	4.0	5.0	5.0	4.0

Table 7

Performance Scale (Five Subtests) Percentage of Cases at or above Each Level of Scatter in the WPPSI-R Standardization Sample

Scatter (range)	Performance IQ					
	≤79	80-89	90-109	110-119	120 +	All
14	.0%	.0%	.0%	.0%	.0%	.0%
13	.0	.0	.1	.0	.0	.1
12	.0	.4	.8	.0	.0	.5
11	.0	1.2	1.5	.4	.6	1.1
10	.0	2.7	2.5	1.8	1.8	2.2
9	2.8	5.3	7.0	6.4	5.3	6.2
8	6.3	10.6	13.8	15.5	10.6	12.7
7	17.6	22.3	26.0	27.1	25.2	24.9
6	33.1	38.9	42.4	43.6	41.6	41.3
5	52.1	59.3	60.3	65.0	60.3	60.4
4	71.8	75.1	77.3	82.2	78.4	77.6
3	88.7	91.7	91.0	95.5	93.6	92.1
2	97.2	98.1	98.5	99.4	99.4	98.7
1	100.0	96.6	100.0	100.0	100.0	99.9
0	100.0	100.0	100.0	100.0	100.0	100.0
N	142	265	837	285	171	1700
M	4.70	5.05	5.22	5.36	5.16	5.17
SD	1.84	2.03	2.12	1.92	1.92	2.04
Median	5.0	5.0	5.0	5.0	5.0	5.0

Table 8

Full Scale (10 Subtests) Percentage of Cases at or above Each Level of Scatter in the WPPSI-R Standardization Sample

Scatter (range)	Full Scale IQ					
	≤79	80-89	90-109	110-119	120 +	Overall
16	.0%	.0%	.0%	.0%	.0%	.0%
15	.0	.0	.1	.0	.0	.1
14	.0	.4	.3	.0	.0	.3
13	.0	.8	1.1	.3	.0	.8
12	.0	2.2	3.2	2.0	1.3	2.5
11	.0	3.8	6.4	5.1	1.9	4.9
10	.7	7.9	12.5	9.5	9.6	10.1
9	8.4	14.2	22.4	22.0	19.9	19.7
8	23.2	30.6	37.8	35.9	37.8	35.2
7	41.5	48.5	56.8	62.0	55.7	55.1
6	64.7	66.4	75.4	76.9	73.0	73.2
5	85.8	87.3	89.6	95.2	91.6	90.1
4	92.8	97.4	97.9	99.6	99.3	97.9
3	99.1	99.6	99.8	100.0	100.0	99.8
2	100.0	100.0	100.0	100.0	100.0	100.0
1	100.0	100.0	100.0	100.0	100.0	100.0
0	100.0	100.0	100.0	100.0	100.0	100.0
N	142	268	839	295	156	1700
M	6.17	6.59	7.04	7.09	6.90	6.89
SD	1.66	1.98	2.12	1.85	1.85	2.01
Median	6.0	6.0	7.0	7.0	7.0	7.0

10 subtests that contribute to the Full Scale (Tables 6, 7, and 8). These tables are organized so that they indicate the rarity of a particular inner-subtest range. Each entry shows the percentage of people whose scatter score is at or above that level. For example, in Table 3, 25% of the children with an IQ of 79 or less had a difference (range) of 6 or more scaled score points on the Verbal Scale.

The average subtest range across all ability levels was 5.01, 5.83, and 7.44 for the 6 Verbal, 6 Performance and 12 Full Scale subtests and was 4.53, 5.17, and 6.89 for the 5 Verbal, 5 Performance, and 10 Full Scale subtests.

As one would expect, the average amount of scatter among subtests tended to increase from lower to higher ability levels regardless of whether one compares all of the subtests in a scale or whether one compares the required subtests only. For example, as seen in Table 5, approximately 32% of the lowest ability group (IQ $\leq$ 79) had a discrepancy of 8 points or greater on the Full Scale IQ, while nearly one-half (48.7) of the highest ability group (IQ $\leq$ 120 +) has a discrepancy this large or larger. A closer look at these data reveals that larger differences in average scatter occur between the lowest and the highest ability groups in both the Verbal and Full Scales as compared to the Performance Scale. This is true whether the scatter is based on either the complete battery or only the required subtests.

DISCUSSION

The results of this study indicate that in the normal population a VIQ-PIQ discrepancy of 10.8 points is quite common for children who take the WPPSI-R. The magnitude of this discrepancy is in line with average discrepancies found in previous investigations with the WISC-R (Kaufman, 1976a) and the WPPSI (Fairweather & Butterworth, 1977); consistent with previous findings, a significant VIQ-PIQ discrepancy also happens to be a quite common one. The higher the ability level of the child, the more likely that he or she will obtain a discrepancy of this magnitude or greater.

In addition to the magnitude of the VIQ-PIQ discrepancy, the clinician also should consider the direction of that discrepancy. As evidenced by the data presented in Table 2, the average PIQ > VIQ discrepancy was slightly larger than was the average VIQ > PIQ discrepancy. There appeared to be no trend for the magnitude of either PIQ > VIQ or VIQ > PIQ discrepancy to vary by ability level.

These two pieces of information should be quite useful for the clinician who is working with young children and is attempting to explain differences in their verbal and performance abilities. In particular, the clinician who utilizes the successive levels approach to interpretation of the WPPSI-R (Gyurke, 1991) can refer to these findings when determining whether the variation and the direction of variation in a child's Verbal-Performance functioning (second level of interpretation) on the WPPSI-R is common for that child's particular level of functioning or whether it is uncommon and indicative of some underlying deficiency.

Turning to the subtest scatter, as is discussed by a variety of experts, a significance of fluctuation is important, but not sufficient for determining whether a discrepancy of a given magnitude is indicative of an abnormality (Kaufman, 1979). Also central to the determination of abnormality is the information on prevalence. Tables 3 through 8, which display the prevalence of subtest scatter for both the full battery and the required subtests, indicate that the higher the ability level of the child,

the more scatter one can expect in his or her performance, particularly on the Verbal and Full Scales. For the total sample of 1,700 children, average subtest scatter of 5 points on the Verbal Scale, 6 points on the Performance Scale, and 7 points on the Full Scale when comparing the full battery of subtests, and scatter of 5 points on the Verbal Scale, 5 points on the Performance Scale and 7 points on the Full scale when comparing only the required subtests is quite common. These data are consistent with findings of a previous study on the WPPSI (Reynolds & Gutkin, 1981) and indicate that it is not uncommon to find scatter of this magnitude.

Given the variation in average scatter across ability levels, it is recommended that for purposes of interpreting the rarity of a given magnitude of scatter, the practitioner should utilize the within ability level frequencies provided in Tables 3 through 8. One should keep in mind that these tables were developed on a non-referred sample and that the frequency of any given level of subtest scatter within a particular clinical group (i.e., mentally deficient, attention deficit disorder, etc.) may be different.

As practitioners become more interested in the neuropsychological interpretation of preschoolers' performance on the WPPSI-R, the data presented here can be used to develop clinically meaningful hypotheses than can be investigated further. Much more work needs to be done to investigate this issue of IQ and subtest scatter within clinical samples. One final note of caution is that, as always, information on scatter should be used in the context of other diagnostic information known about the child and not in isolation.

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