JADARA

Volume 22 | Number 3 Article 6

September 2019

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GENDER DIFFERENCES ON THE WAIS-R PERFORMANCE SCALE WITH YOUNG DEAF ADULTS

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Abstract

The WAIS-R Performance Scale was administered to 185 hearing-impaired young adults (80 females and 105 males) having a mean age of 18.6 years (SD .97). All participants were considered to have a prelingual hearing loss that ranged from moderate to profound. The five subtests and performance IQ (PIQ) were evaluated by t-test computations and principal factor analyses. The only significant mean score difference occurred with the Digit Symbol subtest where the female subjects outperformed their male counterparts by a mean difference of 1.76 points ($t=-4.76$, $p < .0001$). Subtest intercorrelational results suggest that adult deaf males demonstrated better spatial analysis and synthesis skills while the females performed better at visual-motor coordination and speed tasks. A principal factor analysis procedure yielded only one factor for each sex. The high degree of factorial similarity between the male and female samples indicated that the underlying construct being measured by the WAIS-R Performance subtests does not differ by gender.

When Congress passed PL 99-371 (Education of the Deaf Act) in 1986, the need for research concerning the cognitive skills of hearing-impaired adults became a prominent issue. In a report entitled "Toward Equality: Education of the Deaf" (1988), a 12-member commission (mandated by PL 99-371) made 52 recommendations regarding services needed by the deaf community. One of these recommendations called for the expansion of postsecondary and rehabilitative programs. Before such programs can be effective, psychologists and service providers need upgraded information regarding the intellectual profiles of this population.

While many articles have been published pertaining to WISC-R research with deaf children, little has been done concerning the WAIS-R (Wechsler, 1981) with deaf adults. To date, there is only one published journal article on the WAIS-R with hearing-impaired persons. In that study, Braden and Paquin (1985) compared the WISC-R and WAIS-R Performance Scale scores, using a sample of 32 deaf adolescents. Reporting a mean time interval between the tests of 3.5 years, the authors concluded that the WISC-R and WAIS-R Performance scores, with the exception of the Picture Completion subtest, were virtually identical. They suggested that any change in IQ scores from one test to the other should not be assumed to be a result of the test characteristics.

No other journal articles concerning the WAIS-R with hearing-impaired persons could be located after an extensive literature search. What little additional information there is comes from three sources: one is a report available from its author and two are presentations which were made at a national convention.

In the report, Blennerhassett (1985) summarized a survey that showed the WAIS-R Performance Scale to be the primary technique for assessing intelligence of late adolescent and adult deaf clients. In the second source, Blennerhassett, Moores, Hannah, and Woolard (1988) reported that, although WAIS-R Picture Arrangement (PA) subtest scores were significantly higher than WISC-R PA scores, no significant differences between WISC-R and WAIS-R Performance IQs were found in a sample of 154 deaf residential school adolescents. Lastly, Blennerhassett, Moores, and Anderson (1988) presented the only extensive study to date employing only the WAIS-R. By performing factor analyses utilizing all 11 subtests of the WAIS-R with 63 profoundly deaf adolescents who had deaf parents (the deaf-of-deaf) and to 72 profoundly deaf adolescents who had hearing parents (the deaf-of-hearing), they concluded that a two-factor solution emerged for the deaf-of-deaf population while a three-factor solution

surfaced for the deaf-of-hearing group. The authors concluded that there existed different cognitive structures within these deaf population subgroups.

An important realm of concern not yet explored with the adult deaf population is gender differences in cognitive abilities. Maccoby and Jacklin's (1974) extensive review concluded that females generally outperform males in verbal tasks at all ages while males excel in visual-spatial and mathematical task performance beginning in adolescence. The presence of a spatial ability gender difference is a major consideration, for in the assessment of hearing-impaired people, nonverbal spatial-type tasks are frequently used. This approach has been selected to avoid discrimination which could result from the language impairments of the deaf population. It is generally recognized that verbal tests are useful in testing the verbal language abilities, but not the cognitive functioning, of hearing-impaired persons.

Both the WISC-R and the WAIS-R Performance Scales rely heavily on spatial problem-solving tasks. Such a preponderance of items incorporating an ability that has demonstrated gender differences could lead to a confounding of IQ scores. The subtest scores and the PIQ could reflect sex bias rather than mental abilities for hearing impaired test-takers.

While two studies have evaluated sex differences with the deaf population using the WISC-R (Phelps & Ensor, 1987; Sisco, 1982), no published research has evaluated the WAIS-R with deaf persons. The identification of gender-related subtest patterns and PIQ scores is sorely needed in the assessment of deaf adults. This is especially true since both of these studies documented WISC-R Performance subtest bias.

Method

Subjects

A total of 185 hearing-impaired young adults (80 females and 105 males) participated in the study. They ranged in age from 16.1 to 21.3 years, with a mean age of 18.6 (SD .97). All the participants were considered to be prelingually deaf, with hearing loss ranging from moderate to profound. Every subject was a student in attendance at the Missouri School for the Deaf. There were 124 whites, 59 blacks, and 2 Hispanics in the sample. Twelve (6.5%) participants had parents with hearing losses.

Procedure

The WAIS-R Performance subtests were administered using a total communication directional set. Instructions and scoring procedures followed the Wechsler format. All testing was completed by two state-certified school psychologists who were trained and experienced in assessing the deaf population. As there are no deaf norms available with the WAIS-R, the reference age group norms were employed to obtain the scaled scores and Performance IQ. Testing was completed at the Missouri School for the Deaf, a state residential facility which provides assessment services and consultation for the deaf population of Missouri.

Data Analyses

Means and standard deviations for the five WAIS-R subtests and the Performance IQ were first calculated for the entire sample. The group was then divided by sex with means, standard deviations, and t-tests between the subtest means and PIQ computed. A principal components fac-

TABLE 1

WAIS-R SUBTEST t-TEST RESULTS BY SEX

	Scaled Score Mean			
	Males	Females	t value	p value
Picture Completion	8.89	8.44	1.34	NS
Picture Arrangement	9.36	9.13	.58	NS
Block Design	8.47	8.37	2.8	NS
Object Assembly	9.13	9.41	-.62	NS
Digit Symbol	7.46	9.22	-4.76	.0001
WISC-R PIQ	92.57	94.81	-.95	NS

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tor analysis was extracted for each sex grouping, using a scree test and an eigenvalue cutoff of 1.0 to retain factors.

Results and Discussion

The computed WAIS-R PIQ mean for the entire group was 93.54 (SD=15.56). Subtest means for the 185 subjects ranged from 8.22 for Digit Symbol to 9.26 for Picture Arrangement.

When the sample was divided by sex, males scored slightly higher than females on three of the five subtests (Table 1). Female means were higher on two subtests, and on the Performance IQ. However, these group mean differences, as determined by t-test computations, were significant only on the Digit Symbol subtest. The females outperformed their male counterparts by a mean difference of 1.76 points on this subtest, which is important since the scaled scores have a standard deviation of only 3 points. The Digit Symbol subtest received the lowest mean score for the male sample while it came in second only to Object Assembly with the female group.

The Digit Symbol subtest is similar to Coding B on the WISC-R. Past research has reported that females do better than males on the Coding subtest across all levels of intelligence. For example, Karnes and Brown (1980) reported such a finding with gifted children, Vance (1979) with retarded youngsters, and Howe (1977) with normals. Further, Phelps and Ensor (1987) reported similar significant differences ($p < .01$) with the deaf population.

With a normal population where all 12 subtests of the WISC-R were administered, Howe (1977) concluded that the Coding task may be perceived differently by males and females, thus accounting for the discrepancy in performance. She based this conclusion on the finding that Coding loaded heavily on a Verbal factor for males and appeared to be perceived by males as a verbal symbolic task. However, the females in Howe's study had heavy loadings for Coding on a Perceptual factor, suggesting that females perceived Coding as a visual-perception task.

For deaf adults, the Digit Symbol sex difference would not appear to be a function of verbal vs. perceptual orientation, but rather of fine motor coordination. The matrix of intercorrelations among the Performance subtests (Table 2) shows Digit Symbol as generally producing lower correlations than the other subtests. For females, the correlations ranged from .396 (Digit Symbol-Picture Arrangement) to .630 (Digit Symbol-Picture Completion). The male sample correlations were consistently lower, varying from .307 (Digit Symbol-Picture Arrangement) to .549 (Digit Symbol-Block Design).

Digit Symbol has the distinction among the Performance subtests of requiring more accuracy and speed of eye-hand coordination. Research has demonstrated that it has adequate subtest specificity to permit specific interpretation of its functions (Sattler, 1988). The notable sex difference, therefore, could be due to females prossessing better visual-motor coordination and psychomotor speed than their male counterparts. By contrast, the subtest scores and intercorrelations suggest that males generally have better visual organization or spatial skills, especially in the areas of analysis and synthesis.

To determine if there were different factor structures in the cognitive skills of deaf females and males which would account for the sex variation, a principal components factor analysis was completed for each sex. Only one factor with an eigenvalue larger than 1.0 emerged for each group. The high degree of factorial similarity

TABLE 2

WISC-R PERFORMANCE SUBTEST INTERCORRELATIONS FOR FEMALE (ABOVE DIAGONAL) AND MALE (BELOW DIAGONAL) SAMPLES

	PC	PA	BD	OA	DS
Picture Completion (PC)		.568	.599	.487	.630
Picture Arrangement (PA)	.416		.527	.533	.396
Block Design (BD)	.656	.393		.599	.548
Object Assembly (OA)	.536	.456	.665		.515
Digit Symbol (DS)	.484	.307	.549	.539	

All correlations $p < .001$ or better.

TABLE 3

FIRST PRINCIPAL FACTOR LOADINGS

	Females	Males
Picture Completion	.78	.73
Picture Arrangement	.68	.52
Block Design	.76	.82
Object Assembly	.71	.77
Digit Symbol	.71	.65
Explained Variance	96.89%	99.36%

between deaf females and deaf males confirms that the underlying construct or trait being measured by the WAIS-R Performance subtests does not differ by gender (see Table 3). Due to the emergence of only one factor for each group with nearly identical sources of variation, it can be concluded that the five subtests are measuring a general factor of intelligence, and that the structure of the intelligence is parallel across the sexes. Even though there are slight differences in subtest loadings, as well as in rank order of factorial loadings, the differences are quantitative, rather than qualitative.

Maccoby and Jacklin (1974) concluded in their extensive review of the effects of sex differences on general intellectual ability that the "... sexes do not differ consistently in tests of total or composite ability" (p. 65). Although the WAIS-R Performance Scale has no separate norms for deaf persons, this research would support its continued use as an adequate measure of general cognitive ability in hearing impaired adults. While the superior performance of males on visual-spatial tasks has been well documented, the nature of the WAIS-R Performance subtest items does not result in significant score differences between sexes. Further, this research would not support the use of subtest variation for differential diagnosis with the young adult deaf population. The five subtests are highly intercorrelated, and do not have the degree of specificity that has been found through the use of factor analysis in the general population.

It is recommended that further research in this area be conducted, specifically with an older deaf sample. The results need verification before generalizing them to the hearing impaired adult sample at large.

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