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Sex Differences on the Mill-Hill Vocabulary Scale and Scholastic Achievement in Nigerian Public School Students

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Sex differences in verbal ability and scholastic achievement have rarely been examined in African populations. The present study investigated sex differences on the British Mill Hill Vocabulary Scale (MHVS) and scholastic achievement in English and Mathematics in a sample of 5,389 Nigerian public school students aged 11 to 19 years. The MHVS was significantly positively correlated with English and Mathematics, but the correlation was greater for English (r = .39, p < .01) than for Mathematics (r = .19, p < .01). Except for the 11-12 year olds, females obtained consistently higher scores than males on the MHVS and English. However, the differences were modest (average d = -0.11 for MHVS, d = -0.06 for English). There was a slight male superiority in performance in mathematics (d = 0.06). These results were largely consistent with findings from many Western samples.

Keywords: Sex differences; Vocabulary; Verbal ability; Mathematics; Nigeria; Simber effect

Numerous studies in Western populations have reported that there is virtually no sex difference in vocabulary. This conclusion was reached sixty five years ago from a review of the literature by Tyler (1956, p. 244) and has been confirmed in a number of subsequent studies. For instance, there was no statistically significant sex difference on the Mill Hill Vocabulary Scale (MHVS) in Britain among 6 to 15 year olds in the 1979 standardization sample (Raven, 1981) or among 7 to 18 year olds in the British 2007 standardization sample (Raven, 2008). In the United States, there were no statistically significant sex differences in vocabulary in the meta-analysis by Hyde & Linn (1988) and the review by Hedges and Nowell (1995). In contrast, a female advantage in school marks has been frequently reported in many Western samples. For example, a recent meta-analysis based on 502 effect sizes drawn from 369 studies concluded that females performed better than males with a mean *d* of 0.225 in course subjects, and that the female advantage was largest for language courses (mean $d = 0.374$) and smallest for math courses (mean $d = 0.069$) (Voyer, Voyer & Hinshaw, 2014). Most studies of sex differences in vocabulary and school subjects to date have used Western samples so sex differences in Africans remain largely unknown. To provide some data on this issue, the present study examined sex differences in vocabulary, English and Mathematics in Nigeria.

Method

The Set B of the British Mill Hill Vocabulary Scale (MHVS) was administered to 5,551 students attending 30 public junior and senior secondary schools in six school districts in Lagos State in Nigeria in 2013 and 2014. As this sample was developed to examine demographic characteristics and the prevalence of problem behaviors in the general population of school-aged children in Lagos State, the 30 schools were selected to obtain a sample maximally representative of the students attending public schools covering very rural to very urban areas in Lagos State. Students who refused to take the MHVS complaining the test was difficult, those with missing demographic information (e.g., birth year, sex), and unusually old students (age > 20) were removed from data analysis (N = 162). The final sample consisted of 5,389 students from 7th to 11th grades, of which 52.9% were males. Students in the final grade (12th) in senior secondary schools did not participate in the present study because most of them left school at the time of data collection. The mean age of the final sample was 14.6 years (SD = 2.0 years, range 11 to 19 years).

The MHVS consists of 44 multiple-choice questions that ask for a synonym of a word. The test was standardized in the United Kingdom in 2007 and is described in the manual (Raven, 2008). The words are listed in order of difficulty and one point is assigned for each correct answer. No deduction is made for

incorrect answers. Although English is an official language used for education in Nigeria, many indigenous languages are still widely spoken by children at home and at play in the school.

Data collection procedures were that staff of the Ministry of Education were consulted for the selection of schools in each district. With a letter of approval from the Ministry of Education, the second author visited schools and gave tests to twins and sibling pairs in a library or classroom in the school. Research assistants and teachers were employed in the testing room to give instructions and monitor the tests.

In addition, scores of a sub-sample (N = 2,049) of the students on the most recent state-wide English and mathematics exams were taken from the school administrators. The score range of each exam was from 0 to 100. We could not collect exam scores from all students primarily because grading was not finished in many schools at the time we visited them.

Results

Table 1 gives the means and standard deviations of the MHVS for males and females, the results of t-test and F-test, and Cohen's *d* by age group. Figure 1 presents the same data by grade.

Table 1. *Means and standard deviations (SD) of males and females, the results of t- and F-test, and Cohen's d on the MHVS for Nigerian secondary school students by age group.*

Age	Males		Females		t	*F*	*d*
	N	Mean ± SD	N	Mean ± SD			
11-12	418	15.7 ± 5.3	389	15.6 ± 5.2	0.24	0.01	.02
13	517	14.9 ± 5.4	427	15.0 ± 5.7	-0.34	0.69	-.02
14	534	14.9 ± 5.1	425	16.3 ± 5.8	-3.75**	7.86**	-.26
15	408	16.4 ± 5.6	376	17.5 ± 6.0	-2.73**	1.85	-.19
16	421	16.9 ± 5.1	380	17.2 ± 5.4	-1.02	0.49	-.06
17	319	16.3 ± 5.0	292	17.0 ± 5.8	-1.60	5.34*	-.13
18-19	234	15.8 ± 4.9	249	16.2 ± 5.8	-0.68	8.68**	-.07
Average	2851	15.8 ± 5.3	2538	16.4 ± 5.7	-4.11**	19.07**	-.11

* $p < .05$, ** $p < .01$.

The t-test yielded significant results only for two age groups (14 and 15 years). Cohen's *d* was calculated as the males' mean minus the females' mean divided by the pooled standard deviation. A positive value indicates a higher score in males, and a negative value, a higher score in females. In the youngest group

aged 11-12 years, males scored slightly higher than females (d = .02) and in the older age groups females consistently scored higher than males. However, the magnitudes of sex differences were negligible or small ranging from -0.02 to -0.26. As can be seen in Figure 1, the same female superiority was found on the MHVS for each grade except for the 7th grade.

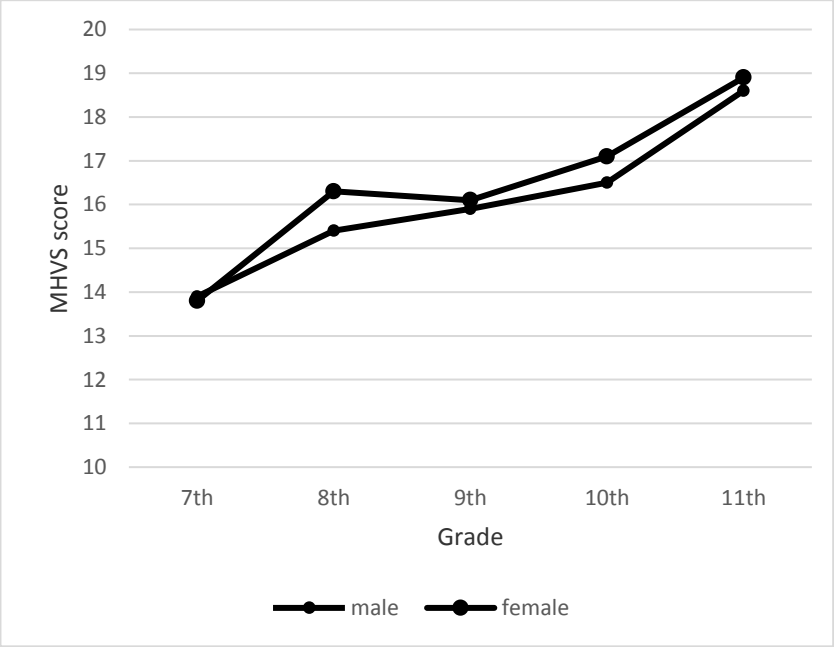

Figure 1. *Means of males and females on the MHVS for Nigerian secondary school students for each grade from grades 7 to 11; r between grade and MHVS = 0.29 for males, and 0.30 for females.*

Table 2 shows the means and SDs of the scores on English and Mathematics tests for males and females and Cohen's *d*. Although none of the sex differences were statistically significant, females were slightly higher than males on the English test, which was consistent with the results from analysis of the MHVS scores. On the mathematics test, however, males scored slightly higher than females.

Table 2. *Means and standard deviations (SD) of males and females, the results of t- and F-test, and Cohen's d on the English and mathematics exams for Nigerian public secondary school students.*

Subject	Males		Females		t	*F*	*d*
	N	Mean ± SD	N	Mean ± SD			
English	1051	51.8 ± 10.7	962	52.4 ± 10.5	-1.31	.01	-.06
Mathematics	1074	52.3 ± 12.3	964	51.6 ± 12.8	1.36	.38	.06

Note: None of the sex differences are significant at $p < .05$.

Discussion

There are five points of interest in the results. First, the data in Table 1 show that there were statistically significant female advantages on the MHVS in 14 and 15 year olds at .26*d* and .19*d*, respectively, but the average female advantage on the whole sample of 0.11*d* was not statistically significant. These results are consistent with a number of studies showing that there is virtually no sex difference in vocabulary in western populations as noted in the introduction.

Second, the data in Table 1 show that the means for the MHVS do not increase much from the younger to the older age groups in both sexes. The correlations of the scores with age groups were very low and not statistically significant ($r = .08$ for males, $r = .10$ for females). The scores for 11-12 years were slightly higher than those for 13 and 14 years possibly because the 11 to 12 year olds in junior secondary schools were advanced students, given that typical ages for the 7th grade in Nigeria are 12 to 13 years. The scores for 18-19 years were lower than those for younger groups in both sexes possibly because the 18 to 19 year olds lagged behind in school, given that typical ages for the 11th grade are 16 to 17 years. The small increase with age contrasts with the British standardization sample in which the mean score of the 11 to 12 year olds was 33 and increased to 46 in the 18 year olds (Raven, 2008). The relatively better performance of younger than the older children has been found in other populations where environmental conditions are believed to be unfavorable for children's cognitive development. It was described in black children in the south of the United States where it was designated the cumulative deficit hypothesis by Jensen (1977), who attributed it to the cumulative impact of unfavorable conditions on intelligence. The same phenomenon has been reported more recently in several Arab countries, where it has been designated the Simber effect by Bakhiet et al. (2018).

Third, there was a small but not statistically significant female advantage of 0.06*d* on the English test. This result, together with that on vocabulary, gives marginal support for the assertion by Halpern (2012, p. 119) that "Evidence from

a variety of sources supports the finding that, on the average, females have better verbal abilities than males."

Fourth, there was a small but not statistically significant male advantage of 0.06*d* on the mathematics test. This result is consistent with Western studies which typically find a female advantage among primary school children and young adolescents and a male advantage beginning in mid-adolescence and increasing into adulthood (e.g., Hyde, Fennema & Lamon, 1990). In a meta-analysis of sex differences in numerical and mathematical ability in the United States, Hyde et al. (1990) concluded there is a female advantage of .21*d* among 9-10 year olds and a male advantage from mid-adolescence into adulthood given as .29*d* among high school students and .32*d* among college students.

Fifth, the standard deviation on the Mill Hill Vocabulary Scale of the females was 5.7 and slightly greater than the 5.3 of the males, contrary to the frequently reported greater range of cognitive ability in males (e.g., Deary, Whalley & Starr, 2009).

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