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The Snijders-Oomen non-verbal intelligence test 2 1/2-7-revised and the final grade point averages of first, second and third grade, combined: a predictive validity study

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THE SNIJDERS-OOMEN NONVERBAL INTELLIGENCE TEST 2 ½ - 7- REVISED AND THE FINAL GRADE POINT AVERAGES OF FIRST, SECOND AND THIRD GRADE, COMBINED: A PREDICTIVE VALIDITY STUDY

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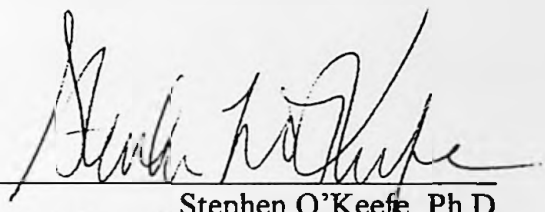
Major Professor 

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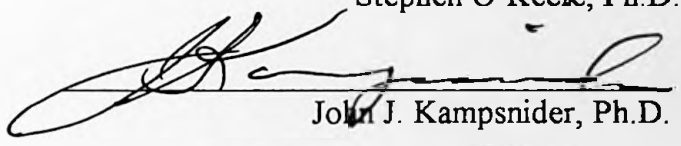

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Abstract

The purpose of this study is to compare the actual achievement of 28 students from the Appalachian area over a three year period with their scores on the SON-R to assess if the instrument is a valid predictor of classroom achievement among culturally impaired youth. The subjects were 11 boys and 17 girls ranging from lower socioeconomic backgrounds, lower-middle class backgrounds, and middle-class backgrounds. Correlation of the SON-R raw score with GPA was moderate at .54 and significant at the .01 level. Correlation of SON-R Subtest scores with GPA were moderate for Mosaics ($r = .47$, $p < .05$), Categories ($r = .51$, $p < .01$) and Patterns ($r = .54$, $p < .01$).

Acknowledgments

I would like to express my sincerest thanks and appreciation to Dr. John J. Kampsnider for his help and encouragement with the completion of this study and also for his support and guidance through the course of my career. I would also like to thank Dr. Stephen O'Keefe for his help and understanding during this study and during my studies at Marshall University Graduate College. A special thanks to Dr. Tony Goudy who made himself available a great many times for help, guidance, and support. I would further like to thank Mary Jo Ashley and the Roane County Board of Education for their participation in this study and many thanks to Debbie Rolston, Head of Psychological Services for Roane County Schools, who played a valuable part in collecting the data. I also would like to thank all the people at Psych Services for their encouragement and support during the final phase of this study.

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THE SNIJDERS-OOMEN NONVERBAL INTELLIGENCE TEST 2 ½ -7 REVISED AND THE FINAL GRADE POINT AVERAGES OF FIRST, SECOND, AND THIRD GRADE, COMBINED: A PREDICTIVE VALIDITY STUDY

The need for valid testing of children has never been more important than it is today with the effort to improve education on a large scale worldwide along with legislation here in the United States that requires that all children receive an education in the least restrictive environment regardless of their abilities, handicaps, or conditions. The Wechsler tests are currently the most popular for placement of children in the academic arena although there is strong evidence that suggests that the Wechsler instruments discriminates in terms of hearing and cultural areas. The WPPSI-R is among the most reliable of all comprehensive preschool intelligence scales (Bracken, 1992). The WPPSI-R is believed to be the test of choice to assess the intelligence of young children (Braden, 1992).

Sattler (1991) states that intelligence tests have a cultural bias. Standard intelligence tests have a strong white, Anglo-Saxon, middle-class bias and do not take into consideration the extraordinary communication required for hearing impaired children. Subcultural practices also are not always compatible with those of the majority cultural and national norms are inappropriate as they are based primarily on white, middle-class, Anglo-Saxon samples. As school systems are progressively using more psychological services to identify, place, and modify curriculum in order to meet the many needs of individual students that are not able to achieve in the standard classroom with standard

instruction there is now a need more than ever for a valid non-verbal intelligence test for children who are deaf, hearing impaired, intellectually impaired where speech is a problem, speaks a different language than the examiner, raised in a rural area or who is raised in a culture where language is used differently such as in the Appalachian region and with Native Americans.

The Snijders-Oomen non-verbal intelligence test (SON) was developed by N. Snijders-Oomen for the use of individual testing of deaf children and first published in the Netherlands in 1943. It was then reprinted in 1958 (English manual, 1966) and 1975. The first revisions expanded the test for hearing children as well as the deaf from age 3 to age 17. The second revision again expanded the test into different series which included the SON-'58 for ages 2 ½ to 7 and SSON in 1975 for ages 7 through 17 years. In 1980 the decision was made to revise the test again and this latest edition replaced both the SON-'58 and the SSON and is now known as the Snijders-Oomen Non-Verbal Test of Intelligence, Revised (SON-R) (Laros/Tellegen 1991). Recent research has found that the SON-R has a significant correlation with the Wechsler Scales that are currently being used most often for placement. The original study conducted by Moore (1994) found that the SON-R IQ correlated .93 with the Performance IQ and .87 with the Full Scale IQ with the WPPSI-R. Unlike the Wechsler Scales the SON-R is thought to be a test of learning potential rather than general intelligence and an accurate predictor of school success. Substantial data have been gathered to support the validity of this test (Tellegen and Laros, 1993). According to the authors, there is a strong relation between school

achievement and intelligence and because of their relationship, school success is considered to be an indication of the validity of an IQ measure (Curran, Elkerton, and Steinberg, 1996). Therefore, studies are being conducted to assess if the SON-R is an accurate predictor of school success in areas where the use of language has a possible discriminating effect for children outside the norm group.

The purpose of this study is to compare the actual achievement in the classroom through grade point average of 28 students from a rural Appalachian area, over a three year period, with their scores on the SON-R to assess if this instrument is a valid predictor of classroom achievement among culturally impaired youth.

Method

Subjects

In October of 1994 the Psychology Department of Marshall University Graduate College (formerly West Virginia Graduate College) and the University of Groningen in Holland conducted a joint study to develop an accurate nonverbal measure of ability for children ages 2 ½ to 7. There are10 males and 18 females ranging from lower socioeconomic backgrounds, lower-middle class backgrounds, and middle-class backgrounds involved in the current study.

Procedures

With parental permission 39 students at Spencer Primary Center were tested with the SON-R and the WPPSI-R and a correlation between the two tests were conducted. In March 1999, 29 of these original subjects still attended Spencer Primary Center.

Permission was requested from the Roane County Board of Education for a follow up to Moore's 1994 study to assess if the SON-R was an accurate predictor of academic success. Permission was granted to collect the final grades to be used in this study. The parents of the remaining 29 students were asked permission for their children's grades to be used for this study with 28 parents granting permission. Therefore data was collected for this study using the final grade point average from first grade, second grade, and third grade of the 28 original children tested. Reading, Spelling, English, and Mathematics scores were used to calculate final GPA as these were the disciplines consistent in first grade, second grade, and third grade.

Instruments

The SON-R was individually administered to students according to manual instructions by graduate students from the United States and Holland who had been appropriately trained in test administration due to a joint study initiated by Dr. Steven O'Keefe of Marshall University Graduate College (formerly West Virginia Graduate College) and Dr. Peter Tellegen from the University of Groningen, the Netherlands.

The SON-R consists of six Subtests, each in two parts, with items of increasing difficulty. Mosaics requires the subject to copy a mosaic pattern in a frame using red, yellow, or red/yellow squares or some combination of the squares. The patterns to be copied are pictured in a stimulus booklet and the first three items are demonstrated by the examiner. Categories part I involves sorting picture cards in a forced choice format, i.e. flower or candy. Part II is in multiple choice format, whereby the child chooses among

five cards the two that have something in common with the pictured objects. Puzzles in part I are constructed within a frame to resemble an example. In part II the frame and examples are not used. Analogies uses separate test booklets for each part. In the first part the child sorts blocks into two boxes according to their shape, color, size or some combination of attributes cued by pairs of pictures in the booklet. Part II is multiple choice and involves the transformation of geometric figures. Situations items in part I depict four objects with half of the picture missing. The child matches the other halves which are printed on cards. Part II requires the child to choose a card or cards from several alternatives to complete a drawn situation with part (s) missing. Patterns are geometric forms copied by the child in the test booklet. A time limit of 150 seconds is imposed on items in parts II of the Subtests Mosaics, Puzzles, and Patterns (Moore, O'Keefe, Lawhon, and Tellegen, 1998). The SON-R 2 ½ - 7 is distinguished from traditional intelligence tests by providing feedback to the child being tested. The child is instructed whether the response was correct or incorrect following each administered item. Each failed item becomes an opportunity to learn, adjust, and change his/her problem solving strategy (Tellegen and Laros, 1993).

Grade point averages are calculated for a total GPA using scores from first, second, and third grade in Reading, Spelling, English, and Mathematics.

Results

Correlation of the SON-R raw score total and the final GPA was moderate and significant ($r=.54$, $p<.01$). Correlations of Subtests with GPA was moderate and

significant for Mosaics ($r=.47$, $p<.05$), Categories ($r=.51$, $p<.01$), and Patterns ($r=.54$, $p<.01$). Correlations of Subtests Analogies, Puzzles, and Situations with GPA were not significant yet the overall SON-R raw sore total revealed a score higher than the individual Subtests alone indicating the test as a whole is a better predictor of school achievement than any one particular Subtest. Results are presented in Table 1.

Insert Table 1 about here

Discussion

A prediction equation was used to analyze data which is the final grades from first, second, and third grades, in Reading, Spelling, English, and Mathematics, combined in a grade point average score total. The predictors are the six Subtests and the SON-R raw score total obtained from the original testing. Raw scores are being used as the children involved in the study are within the same age range. The correlation of the SON-R raw score total and the final GPA was .54 at the .01 level of significance which indicates that the SON-R is a moderate predictor of school achievement. The correlations of GPA with the subtests revealed surprising results as Mosaics, Categories, and Patterns correlated moderately with GPA but the correlations with subtests Analogies, Puzzles and Situations were not significant. These results indicate that the SON-R as a whole is a better predictor of school success than any of the subtests individually.

Moore's study of the concurrent validity of the SON-R with the WPPSI-R in 1994

Table 1

Correlations Between the SON-R Subtests, Total Raw Scores, and Grade Point Averages

	GPA	Mosaic	Catego	Analog	Pattern	Puzz	Situation	Total
GPA								
Mosaics	.47*							
Categories	.51**	.48*						
Analogies	.17	-.02	-.12					
Patterns	.54**	.46*	.45*	.09				
Puzzles	.34	.73**	.37	.31	.43*			
Situations	.05	.53**	.30	.05	.00	.55**		
Total	.54**	.76**	.61**	.44**	.62**	.86**	.57**	

* Significant at the .05 level
** Significant at the .01 level

revealed a significant correlation of .93 and .87 with the WPPSI-R Performance IQ and Full Scale IQ respectively with a correlation of .45 with Verbal IQ which was not significant. The SON-R appears to have a higher predictive value at .54 as Sattler (1992) reports that the Wechler Scales have a highly varied correlation with school achievement and sited only the WISC-R with a correlation of .39. However, Lowe, Anderson, Williams, and Currie conducted a study in 1987 to investigate the long term predictive validity of the WPPSI. Their study correlated the WPPSI, WISC-R, and WAIS-R with academic success as demonstrated by scores on a variety of achievement tests and grades achieved in the classroom. Their subjects were black school children in Mississippi in first through eleventh grade. The correlations between WPPSI FSIQ and overall GPA in first and eleventh grades were .62 and .56 respectfully. Performance IQ was a better predictor of overall GPAs in 7 of 11 grades and of subject area GPAs in all grades. Overall, FSIQ was a better predictor of standardized achievement test scores than actual achievement within the classroom (Moore, 1994).

Other general intelligence test such as the Stanford-Binet intelligence Scale: Forth Edition (Thorndike, Hagen, & Sattler, 1986) also have a highly varied correlation of criterion-related validity. The technical Manual for the SB:FE presents several studies investigating the Scale's criterion validity. In 13 studies reported in the manual, correlations between the SB:FE and these criterion measures ranged from a low of .27 to a high of .91 (Sattler, 1992). The McCarthy Scales of Children's Abilities (McCarthy, 1972) has satisfactory predictive validity with various achievement tests, including the

Metropolitan Achievement Tests, Peabody Individual Assessment Test, Wide Range Achievement Test, and California Achievement Test (Sattler, 1992) but there does not appear to have significant value as a predictor of school achievement. The Kaufman Assessment Battery for Children (Kaufman & Kaufman, 1983) had only adequate predictive validity when correlated with various achievement tests administered 6 to 12 months after the K-ABC (Sattler, 1992). The predictive validity for school success as measured by GPA does not appear to be significant.

Tellegen and Laros, 1993 contend that general intelligence (GI) tests like the Stanford-Binet and the Wechsler Scales have been criticized on the point that these tests measure the end result of prior learning rather than learning potential. Other criticisms are that GI tests underestimate the learning ability of the subject due to fewer opportunities to acquire skills and knowledge. That they do not provide information on the growth in performance that is expected given optimal learning conditions and they are said to discriminate insufficiently between mentally retarded and learning disabled children. The criticism that low performance on a GI test may reflect poor verbal knowledge instead of poor reasoning or learning ability has led to the development of nonverbal intelligence tests.

The SON-R is considered to be a test of learning potential rather than general intelligence and according to the authors, there is a strong relation between school achievement and intelligence and because of their relationship, school success is considered to be an indication of the validity of an IQ measure (Tallegen and Laros,

1993). The majority of research on GI tests has been conducted using standardized achievement tests as proof of predictive validity which does reflect prior learning rather than learning potential. School achievement as measured by GPA is criticized for variables such as class attendance, completion of homework, motivation, etc. This study, however, reveals a moderate correlation between SON-R scores and school achievement in an area where language and cultural experience has the potential of being a handicap as compared to other parts of the world. Further studies should be conducted in this area to fully assess the potential of the SON-R's value in predicting school achievement.

Studies on concurrent validity of the SON-R has been conducted with varying results. Moore 1994 found a high and significant correlation of (r=.93, p,.05 between the WPPSI-R Performance IQ and the SON-R IQ. The correlation with the Verbal IQ was not significant. However, the mean Performance IQ on the WPPSI-R was 97.4 with a Standard Deviation of 15.3 while the mean SON-R IQ score was 87.5 with a Standard Deviation of 16.0. The mean SON-R IQ Score was 9.9 points lower than the WPPSI-R Performance IQ Score.

Curran (1996) conducted a study with Native American children where English was a second language using the WISC-III and the SON-R. This study revealed a mean Performance IQ of 102.3 (sd=11.5) with a mean SON-R IQ of 97.4 (sd=12.7) and reports no significant difference. Other studies have reported the mean SON-R IQ Score to be lower than that of the Wechsler Scales where subjects spoke English as their first language whereas scores were not significantly different in Curran's study of Native American who

spoke English as their second language. Curran stated in her study that the patterns of correlations suggest that the SIQ is measuring elements of verbal and nonverbal intelligence. The idea that because the test responses on the SON-R are not verbal in nature does not necessarily mean the reasoning used is not language based. She states further that perhaps the SON-R subtests are measuring fluid intelligence that is not measured by the WISC-III. Although the SON-R is described as a nonverbal instrument, almost half of the significant subtest correlations were with verbal subtests. The small number of significant subtest correlations seems to suggest the SON-R is measuring aspects of intelligence that are different from the WISC-III. However, these findings are not consistent with other studies here in the United States which have shown the SON-R to be highly correlated with the performance subtests of the Wechsler Scales.

The results of this study should be interpreted with caution since the sample size was relatively small. Further studies could include a larger sample size and include subjects from a wide range of areas. However, it appears this test has predictive value of school success for children with and without language barriers which suggests the SON-R is a measure of a different aspect of intelligence and confirms Tallegen and Laros belief that the SON-R is a measure of learning potential.

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Appendix A: Raw Data

		SON-R						Grade Point Average	
ID #	gender	Mos	Cat	Puz	Ana	Sit	Pat	Raw Score	Total GPA
001	F	7	9	7	11	7	10	51	3.92
002	M	8	9	9	10	9	11	56	3.17
003	F	9	8	6	9	10	10	52	3.75
007	F	8	7	8	11	9	10	53	3.25
008	M	8	6	6	9	7	9	45	3.58
011	F	9	11	8	6	8	1	53	3.92
013	F	8	8	9	11	9	8	53	2.17
014	M	8	9	9	12	10	9	57	2.69
018	F	8	10	8	13	6	14	59	3.92
019	F	9	11	8	9	9	10	56	4.00
020	F	9	11	9	7	11	9	56	4.00
021	F	8	10	9	10	8	12	57	4.00
022	F	10	10	10	11	11	13	65	4.00
043	F	7	8	7	12	7	9	50	4.00
044	M	8	9	7	12	10	9	55	3.75
045	F	4	4	7	12	8	8	43	2.50
046	F	8	9	8	5	8	10	48	3.33
047	F	9	12	9	5	9	10	54	3.92
048	F	9	8	8	11	9	7	52	3.00
049	M	8	8	8	8	11	8	51	2.25
050	M	8	6	9	12	8	10	53	3.33
051	F	8	10	10	13	12	10	63	4.00
052	F	9	7	9	8	9	13	55	3.92
053	M	8	7	8	6	9	10	48	2.50
054	M	7	8	6	7	9	9	46	3.50
055	M	10	10	8	6	10	12	56	2.83
058	F	2	8	1	6	6	8	31	2.17
059	M	9	13	10	13	10	13	68	4.00

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