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ABSTRACT

The Brain Wave Analyzer (BWA Ertl 02) was used to measure the brain potentials of 110 public school children. Resulting scores were correlated with concurrent measures of school achievement. Results indicate that certain brain wave scores have relatively low correlations with school achievement compared to traditional intelligence measures but may add to the ability to predict school achievement when combined with traditional intelligence measures. (Author/MV)

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BRAIN WAVE ANALYSIS AND SCHOOL ACHIEVEMENT

by

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You may recall an interview published in Phi Delta Kappan not long ago titled "Goodbye IQ, Hello EI (Ertl Index)."[1] The interview subject was John Ertl, inventor of an instrument he called the neural efficiency analyzer, which was designed to measure brain waves. The article suggested that the instrument might eventually improve our ability to identify gifted children early, as well as diagnose learning disabilities, and do both in a manner that would preclude bias due to cultural differences.

The purpose of our research was to determine the relationship between brain wave scores, school achievement measures, and traditional IQ measures.

It should be noted that the instrument used in our testing was a Brain Wave Analyzer (BWA 02) leased from Neural Models Limited, of which Ertl is president. The BWA 02 attempts to analyze the resting, unstimulated brain; therefore, no stimulation of any kind is used. The procedure employed with the BWA 02 differs from that used with the earlier instrument, the neural efficiency analyzer, since the latter analyzed average evoked potentials in response to stimulation.

There has been some effort to compare scores derived from Ertl's instruments with traditional intelligence measures. Typical of these studies was one by Ertl which used average evoked potential (AEP) with scores made on three psychometric tests of intelligence (the Otis Quick-Scoring Test of Mental Ability, the Primary Mental Abilities Test, and the Wechsler Intelligence Scale for Children). Correlations between the AEP latencies and these tests ranged from approximately -.20 to -.50.[2]

Ertl and E. Douglass[3] used 200 visual stimuli and 200 auditory stimuli with five children diagnosed as dyslexic and found that AEPs from the right and left parietal areas were greatly out of phase compared with normal subjects. However, results of such studies indicate that there is some relationship between AEP and traditional IQ measures, as well as a relationship with what are considered to be developmental disorders. However, the magnitude of this relationship is yet to be determined. Ertl himself estimates that his neural information transfer scores and traditional IQ scores overlap approximately 20% in what they measure.

Our original intent in our research with Ertl's Brain Wave Analyzer was to examine the claims Ertl had made concerning the culture-free aspects of his measurement and the utility of the instrument for learning disabled children. However, it became apparent to us that both claims assume that the scores obtained on the instrument relate to behavioral outcomes--more specifically for educators, school achievement.

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1. William Tracy, "Goodbye IQ, Hello EI (Ertl Index)," Phi Delta Kappan, October, 1972, pp. 89-92.

2. John P. Ertl, "Evoked Potentials, Neural Efficiency, and IQ," in Lorene D. Proctor, ed., Biocybernetics of the Central Nervous System (Boston: Little Brown and Company, 1969). pp. 419-39

3. John P. Ertl and E. Douglass, "Evoked Potentials and Dyslexia," Internal Reports No. 32 (Toronto, Ontario, Canada: Neural Models Limited, 1970)

In order to determine if the scores on the Brain Wave Analyzer do in fact correlate with measures of school achievement, two studies were conducted in a metropolitan elementary school district. The results of each of the studies are presented below.

Price Lab School Study, Spring 1975

In the first study, which served as a pilot, we were limited to two days of testing with the Ertl instrument. Parental consent was obtained for 95 children, grades 1 through 6. Of these, 44 were tested. The following table indicates the breakdown of the sample by sex and grade level. Selection of children to be tested was not entirely random due to the school schedule.

TABLE 1

	Male	Female
Grade 1	4	1
Grade 2	2	1
Grade 3	4	3
Grade 4	2	2
Grade 5	3	4
Grade 6	6	12
TOTAL	21	23

During the three weeks following testing with the Ertl instrument, all subjects were individually administered the Wide Range Achievement Test.

Results

Table 2 is a table of means for the three WRAT Subtests and the nine measures taken from the Ertl instrument.

TABLE 2

	Mean	S. D.
WRAT Spelling	99.57	15.63
WRAT Reading	108.14	19.64
WRAT Math	91.82	14.21
Period Average	76.33	9.10
Alpha Period	.21	.06
Symmetry	1199.00	159.00
Frequency	1.21	.09
Neural Information Transfer (NIT)	67.01	9.19
Neural Efficiency (NE)	74.86	14.01
Symmetry (SYM)	.76	.03
Time Differential	9.11	1.56
Phase Symmetry	.38	.07

Table 3 presents correlations obtained between the three primary scores from the BWA 02 and the three WRAT subtests.

TABLE 3

	Spelling	Reading	Math
NIT	-.29*	-.11	.07
NE	.02	.10	.12
SYM	-.24	-.19	-.06

*p < .05

Discussion

While there are certainly limitations with respect to size of sample, representativeness of sample, and adequacy of the achievement instrument, results do not suggest a significant relationship between school achievement and brain wave scores.

Lincoln School Study, Fall 1975

Purpose

The fall study was designed to directly compare the BWA 02 achievement relationship with the relationship of a traditional group intelligence test and corresponding school achievement. In addition, we wanted to see how the two measures might combine to predict school achievement.

Subjects and Methodology

Eighty-one fifth and sixth-grade students from Lincoln School in Cedar Falls, Iowa, were tested with the BWA 02. Sixty of the students were in the sixth grade and had been tested with the Kuhlman-Anderson Intelligence Test the previous spring. The Iowa Tests of Basic Skills (ITBS) achievement tests were given to all students just previous to our testing with the Ertl instrument.

Results

Table 4 presents a correlation matrix for the variables studied.

TABLE 4

	KAIQ	NIT	NE	SYM	ITBS
Kuhlman-Anderson IQ		.02	.01	.03	.69
NIT			.97	.24	-.08
NE				-.04	-.01
SYM					-.36

Table 5 presents a summary table for the stepwise multiple regression procedure used to analyse the relationship between criterion (ITBS scores) and predictors (brain wave and intelligence test scores). The stepwise solution included variables in the equation only if the F ratio computed in a test of significance of the regression coefficient was significant at .01. In this case, only the K-A and SYM met that criterion.

TABLE 5

Dependent variable: Composite Scores on ITBS

	R	R^2	Increase in R^2
Kuhlman-Anderson IQ	.69	.47	.47
SYM	.78	.62	.15

A table of means for the Lincoln School sample is presented in Table 6.

TABLE 6

	Mean	S. D.
Kuhlman-Anderson IQ	114.6	12.6
NIT	64.22	10.13
NE	74.51	11.5
SYM	.74	.05
Composite ITBS	6.2	1.4

Since Ertl had reported results which differentiated between scores obtained on samples of retarded and samples of successful professionals, mean scores were computed on the 10 highest and 10 lowest achieving students based upon ITBS scores. Results are shown in Table 7 and indicate that scores obtained on the BWA 02 fail to differentiate between these two achievement groups.

TABLE 7

Comparison of Mean Scores for High and Low Achieving Students

	Top 10 Achievers		Bottom 10 Achievers		t
	Mean	S. D.	Mean	S. D.	
Composite ITBS	8.2	.4	4.0	.3	24.84*
Kuhlman-Anderson	124.1	7.2	96.3	6.9	8.81*
NIT	65.6	3.0	65.2	2.4	.11
NE	76.7	11.7	76.8	10.3	-.01
SYM	1346	217	1383	524	-.21

* $p < .001$

Discussion

When compared to a traditional paper and pencil measure of intelligence, the scores obtained on the BWA 02 show little or no linear relationship with a measure of school achievement when administered to a sample of fifth and sixth grade students. It remains to be seen whether the instrument can add to the prediction of achievement yielded by traditional instruments in an amount that could have educational significance.

Further research might also investigate the usefulness of the instrument with deviant populations, e.g., brain damaged children, learning disabled children, etc. A further possibility is that non-linear relationships between BWA 02 scores and school achievement exist, although there is no evidence for such relationships in this study.

The results further suggest that there is overlap on BWA scores between the high achieving and low achieving students, and that the mean BWA scores of the two groups are not significantly different from each other.

The research collected by the authors therefore indicates that the relationship between neural efficiency scores as measured by the BWA and school achievement scores for subjects in the normal range of IQ scores is probably slight, but BWA scores may add to our ability to predict school achievement when combined with traditional intelligence measures.