THE RELATIONSHIP BETWEEN STATE-TRAIT ANXIETY AND INTELLIGENCE IN PUERTO RICAN PSYCHIATRIC PATIENTS [1]

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ABSTRACT. Psychiatric patients at the San Juan Veterans Administration Hospital were given the Spanish version of the WAIS, the *Escala de Inteligencia Wechsler para Adultos* (EIWA), and the Spanish edition of Spielberger's *State-Trait Anxiety Inventory* (STAI). The STAI A-State scale was administered immediately before the EIWA (A-State-1), and, again, immediately after the EIWA (A-State-2). A short form of the STAI A-State scale was also given immediately after each of the eleven EIWA subtests. Significant negative correlations of the STAI A-Trait scale and the A-State-2 scale were obtained with the EIWA Full Scale, the Verbal and Performance scales, the "Wechsler Triad," and the Timed and Untimed EIWA subtests. In addition, scores on each EIWA subtest were inversely correlated with the Short Form A-State scales, except for Vocabulary and Analogies. Patients with high A-Trait scores showed higher levels of A-State intensity while performing on the EIWA than low A-Trait patients. Moreover, the A-State levels of the HA-Trait patients tended to increase during their performance on the EIWA, while level of A-State for the LA-Trait patients remained relatively constant from the beginning to the end of the EIWA.

RESUMEN. Un grupo de pacientes psiquiátricos del Hospital de Veteranos de San Juan fueron evaluados con la versión castellana del WAIS intitulada *Escala de Inteligencia Wechsler para Adultos* (EIWA), y con la edición castellana del Inventario de Ansiedad de Spielberger (Spielberger *State-Trait Anxiety Inventory*). La Escala de Ansiedad fue aplicada inmediatamente antes de aplicar la Escala EIWA (Estado de Ansiedad 1) y, luego, inmediatamente después de la Prueba Wechsler (Estado de Ansiedad 2). También se aplicó una forma abreviada de la Escala de Ansiedad inmediatamente después de cada uno de los subtests del EIWA. Correlaciones negativas significativas entre ambas escalas y el EIWA en su forma completa se obtuvieron en este estudio. También se obtuvieron correlaciones negativas significativas entre las dos pruebas de ansiedad y las Escalas verbales y de ejecución del EIWA, la "Tríada Wechsler" y los subtests cronometrados y los no-cronometrados. Además, los puntajes en cada uno de los subtests del EIWA estaban inversamente correlacionados con las Escalas Abreviadas de Ansiedad, con la excepción de las pruebas de Vocabulario y Analogías. Los pacientes que obtuvieron puntajes altos de rasgos de ansiedad mostraron niveles más altos de estados de ansiedad mientras ejecutaban las pruebas del EIWA que aquellos que obtuvieron puntajes bajos. Además, los niveles de *estado* de ansiedad de los pacientes que mostraban *rasgos* altos de ansiedad tendían a aumentar mientras ejecutaban las pruebas del EIWA; por otra parte los niveles de

estado de ansiedad de los pacientes con *rasgos* bajos de ansiedad permanecieron re-
relativamente constantes desde el principio hasta el final del EIWA.

Inferences about personality variables from measures of intellectual
functioning have become an important aspect of clinical diagnosis (Rapa-
port, Gill & Schafer, 1968). The *Wechsler* (1955, 1958) *Adult Intelligence
Scale* (WAIS) is the most widely used measure of intelligence in clinical
practice (Sundberg, 1961), and anxiety is one of the most important per-
sonality variables in terms of its influence on intellectual functioning
(Gaudry & Spielberger, 1971).

The literature on anxiety and intelligence as measured by the WAIS
may be divided into three types of investigations: (1) studies of the gen-
eral relationship between anxiety and intelligence; (2) studies designed
to test the hypothesis that low scores on selected Wechsler subtests reflect
the presence of anxiety; and (3) studies of intelligence test performance
in which anxiety was induced experimentally. In studies of the general
relationship between anxiety and the WAIS, the research findings have
been inconsistent and often contradictory (e.g., Dana, 1957; Goodstein &
Farber, 1957; Jurjevick, 1963; Kraus, 1965; Matarazzo, 1955).

Several investigators have tested the hypothesis that low scores on se-
lected WAIS subtests reflect the presence of anxiety. For example, Sieg-
man (1956) compared the performance on timed and untimed WAIS sub-
tests for subjects with high and low anxiety as measured by the *Taylor*
(1953) *Manifest Anxiety Scale* (MAS). He found that subjects with high
anxiety obtained lower scores on the timed subtests than low-anxiety
subjects, and that these groups did not differ on the untimed subtests. Ed-
wards (1966) administered the MAS and the IPAT Anxiety Scale (Cattell
& Scheier, 1961) immediately after the WAIS, with results that were quite
different from those reported by Siegman. He found that the WAIS timed
subtest correlated .25 with the MAS and .46 with the IPAT, and that the
Wechsler Triad (Digit Span, Digit Symbol, and Arithmetic) correlated
.66 with the MAS, and .69 with the IPAT.

A considerable volume of research has been devoted to evaluating
Wechsler's (1958) hypothesis that attention, as reflected in scores on the
Digit Span subtest, is disrupted by anxiety. The results of early studies
were mostly negative (e.g., Gillhooly, 1950; Lewinski, 1945; Rashkis &
Welch, 1946). More recently, Hodges and Spielberger (1969) found a
significant inverse relationship between Digit Span and scores on Zucker-
man's (1960) *Affect Adjective Checklist* (Today form), but no relation
with the MAS. The AACL-Today Form appears to measure state anxiety,

whereas the MAS is a measure of trait anxiety (Spielberger, 1972). Thus, the inconsistent findings with regard to the relationship between anxiety and intelligence may be due, in part, to the failure to take into consideration the distinction between anxiety as a transitory state (A-State) and individual differences in trait anxiety (A-Trait) as a relatively stable personality disposition (Cattell & Scheier, 1961; Spielberger, 1966, 1972).

In studies in which anxiety (presumably, A-State) was induced experimentally, the findings are also equivocal and inconsistent. Sarason and Minard (1962), for example, found no relationship between scores on the WAIS Digit Symbol subtest and a test anxiety questionnaire in a "neutral" condition, but Digit Symbol performance improved for anxious women in a "threat of failure" condition, while the reverse was found for anxious men. Sherman and Blatt (1966) found that Digit Span and Digit Symbol scores were elevated after a failure experience, and that vocabulary was relatively unaffected by the experimental failure manipulation. Similarly, Walker and Spence (1964) found decrements in digit span in subjects who reported feeling "distressed" when they were told they were selected for the experiment because of questionable academic performance, but no decrements for subjects given the same instructions who did not report feeling distressed.

In summary, the findings of investigations of the relationship between anxiety and intelligence are inconsistent, but most investigators have failed to take the state-trait distinction into consideration and have not used appropriate measures of anxiety. A more adequate study of the relation between anxiety and intelligence would require the measurement of the actual level of state anxiety (A-State) that is experienced in an experimental situation by individuals who differed in anxiety as a personality disposition (A-Trait).

The relationship between state and trait anxiety and intelligence in Puerto Rican psychiatric patients was investigated in this study. The Spanish edition (STAI-SX) of the *State-Trait Anxiety Inventory* (Spielberger, Gonzalez-Reigosa, Martinez-Urrutia, Natalicio & Natalicio, 1971) was used to measure anxiety, and intelligence was measured by the *Escala de Inteligencia Wechsler para Adultos* (EIWA), the Spanish edition of the WAIS (Wechsler, 1968). It was hypothesized that measures of intelligence would be inversely related to STAI-SX A-State and A-Trait scores, and that these correlations would be larger with A-State scores than with A-Trait scores. These relationships will be evaluated with the EIWA Full Scale, Verbal Scale, and Performance Scale IQ scores, and with scores

obtained on the EIWA Wechsler triad, the timed and untimed EIWA subtests, and each of the individual EIWA subtests.

METHOD

Subjects

The subjects were 40 male patients at the U.S. Veterans Administration Hospital in San Juan, Puerto Rico. Of these, 15 were newly admitted psychiatric inpatients and 25 were psychiatric outpatients. The inpatients had been referred for psychological evaluation by ward psychiatrists. The outpatients were randomly selected from the Neuropsychiatric Outpatient Clinic files and notified to contact the experimenter at the Psychology Service. The patients ranged in age from 20 to 49 years, and had a median educational level of 12.5 years.

Test Instruments

The Spanish version of the Wechsler Adult Intelligence Scale (Wechsler, 1968). *Escala de Inteligencia Wechsler para Adultos* (EIWA), consists of six verbal subtests and five performance subtests. The standardization of this scale was based on a random sample of 1,127 subjects who were selected as representative of the general adult population of Puerto Rico on the basis of the 1960 Census. The same variables considered in the standardization of the WAIS were taken into account in the standardization procedures for the EIWA (Wechsler, 1968).

The Spanish edition of the *State-Trait Anxiety Inventory* (STAI) developed by Spielberger, *et al.*, (1971) to be equivalent to the English STAI (Spielberger, Gorsuch & Lushene, 1970), consists of separate self-report scales for measuring state anxiety and trait anxiety. The STAI A-Trait scale asks the individual to describe how he generally feels, while the A-State asks the individual to describe how he feels at a particular moment in time. Correlations between the Spanish and English forms of the STAI A-State and A-Trait scales for bilingual Puerto Rican and Mexican-American college students ranged from .85 to .94 (Spielberger, *et al.*, 1971). A 5-item short form of the Spanish STAI A-State scale, comprised of the items in the English edition with the highest item-remainder coefficients in previous research (see Spielberger, O'Neil & Hansen, 1972), was also used.

Procedure

Each patient was tested individually. Prior to testing, the patient was informed that he would be given an intelligence test as part of a battery

for the assessment of his psychological functioning. Immediately after this brief explanation, the Spanish STAI A-State and A-Trait scales were administered with standard instructions. The EIWA was then administered with standard instructions.

After each of the EIWA subtests, the 5-item Short Form of the Spanish STAI A-State scale was administered, with instructions for the patients to respond according to how they felt during the particular subtest they had just finished. After the EIWA, the Spanish STAI A-State scale was given again with instructions for the patients to respond according to how they felt while working on the tests they had just completed.

RESULTS AND DISCUSSION

The findings will be reported and discussed as follows: (1) analysis of the relationships among the measures of state and trait anxiety; and (2) evaluation of the relationship between anxiety and intelligence.

Patients' Anxiety Scores

The means and standard deviations of the scores of the psychiatric patients on the Spanish STAI A-Trait scale, the A-State scale given prior to

TABLE 1

Means and Standard Deviations for the STAI A-Trait
Scale and the A-State Scales given to the Psychiatric
Patients Before and After the EIWA

	A-Trait	A-State-1	A-State-2
Mean	60.03	54.78	53.50
SD	8.39	9.64	14.57

the administration of the EIWA (A-State-1), and the A-State scale given after the patients completed the EIWA (A-State-2) are reported in Table 1. The range of scores on the A-Trait scale for the psychiatric patients in this study was 42 to 78, and the mean was 60.03. In a previous study, scores

TABLE 2

Means and Standard Deviations for
the Short Form A-State Scales Given
After Each of the EIWA Subtests and
Correlations of These Scales With
the STAI A-State-1, A-State-2 and
A-Trait Scores

Short Form A-State Scale Given After	Correlation with A-State and A-Trait Scales				
	Means	S.D.	A-State-1	A-State-2	A-Trait
Information	12.33	3.10	.41**	.78**	.48**
Comprehension	12.73	3.45	.58**	.77**	.51**
Arithmetic	12.93	3.92	.24	.48**	.22
Analogies	13.15	3.85	.43**	.49**	.47**
Digit Span	13.40	3.69	.34*	.73**	.50**
Vocabulary	12.65	4.28	.45**	.62**	.43**
Digit Symbol	13.25	3.52	.41**	.79**	.60**
Picture Comp.	12.75	4.03	.39**	.81**	.53**
Block Design	13.98	3.48	.51**	.78**	.68**
Picture Arrg.	13.18	3.92	.48**	.84**	.65**
Object Assb.	13.28	4.08	.47**	.93**	.63**

**p $\leq$ .01
 *p $<$ .05

on the A-Trait scale for college students at the University of Puerto Rico ranged from 20 to 54; not a single college student scored as high as the A-Trait mean of the psychiatric patients in this study (Spielberger, *et al.*, 1971).

With respect to the STAI A-State scores, the results in Table 1 showed that the patients were, on the average, slightly more anxious before taking the intelligence test (A-State-1) than while they were working on it (A-State-2), and that the variability (*SD*) of the A-State scores was greater while the patients were working on the EIWA than before the test. These findings may be interpreted as indicating that most of the patients decreased in A-State while they were taking the test. It was observed in administering the EIWA, however, that some patients showed a substantial increase in anxiety during the test, and this was reflected in the larger *SD* for A-State-2.

It is interesting to note in Table 1 that the mean scores for the patients on the two A-State measures were considerably lower than their mean A-Trait score. Since A-Trait scores may be interpreted as representing the average level of the anxiety states that an individual experiences in everyday life, these findings would seem to indicate that the patients were less threatened by the testing situation than by their usual life circumstances.

The means and standard deviations of the scores on the Short Form A-State scales given after each of the EIWA subtests, and the correlations between these Short Form scales and scores on the A-Trait, A-State-1, and A-State-2 scales are presented in Table 2. It may be noted that the Short Form A-State scales were more highly correlated with A-State-2 scores than with either A-State-1 or A-Trait scores. Since the scores on the Short Form A-State scales were based on the patients' feelings while taking each of the subtests, it would be expected that these scores would correlate more highly with how they felt while working on the entire test (A-State-2) than with either apprehension prior to the test (A-State-1) or the patient's general (average) anxiety level (A-Trait).

The next step in the analysis was to examine the changes in A-State scores for patients who differed in A-Trait while they were performing on each of the eleven EIWA subtests. For this analysis, the response measures were the scores obtained on the Short Form A-State scales given immediately after each of the EIWA subtests. High and low A-Trait groups were defined by dichotomizing the patients at the median A-Trait score (60.5). Patients having A-Trait scores of 61 or above constituted the

HA-Trait group; patients with scores of 60 or below comprised the **LA-**Trait group.

The mean scores on the Short Form A-State scales corresponding to each of the 11 EIWA subtests are reported in Figure 1 for the HA-Trait and LA-Trait groups. These data were evaluated in a 2 by 11 analysis of variance for repeated measures, which is presented in Table 3. The significant A-Trait by Subtest interaction appeared to reflect a tendency for
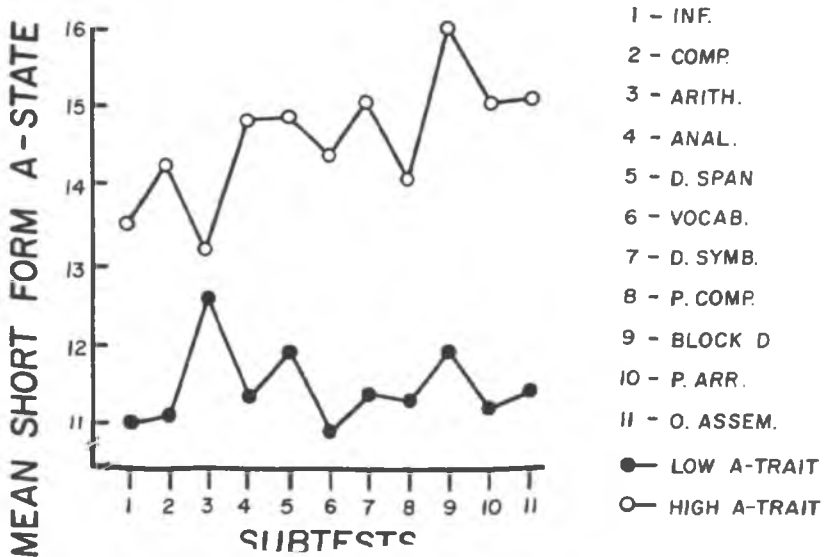

Figure 1. The mean scores of the HA-Trait and LA-Trait patients on the STAI Short Form A-State scales given immediately after each of the eleven EIWA subtests.

the HA-Trait patients to become more anxious as they progressed through the EIWA subtests, whereas the A-State level of LA-Trait patients did not seem to show any systematic change from the beginning to the end of the EIWA. The highly significant main effect for A-Trait indicated that the HA-Trait patients were consistently higher in A-State than the LA-Trait patients.

It is interesting to note in Figure 1 that the HA-Trait patients were less threatened during the Arithmetic subtest than on any other subtest, whereas the LA-Trait patients were most threatened by this subtest. Since Arithmetic is one of the subtests that is believed to be most susceptible to influence by anxiety, as evidenced by its inclusion in the "Wechsler Triad,"

the present findings suggests that Arithmetic may indeed arouse anxiety, but primarily in LA-Trait individuals.

Another interesting finding in Figure 1 is that the HA-Trait patients were apparently more threatened during performance on the Block Design than on any other subtest, and that the A-State scores of the LA-Trait patients were also relatively high on this subtest. According to Wechsler (1955, 1958), the Block Design subtest requires the subject to perceive the pattern of the stimuli, analyze it into its parts, and then synthesize it

TABLE 3

Summary of the Analyses of Variance
of the Short Form A-State Scores
Obtained After Each EIWA Subtest

Source	df	MS	F
A-Trait (A)	1	1063.31	12.82***
Error	38	82.97	
Subtests (T)	10	7.96	1.67
A by S	10	9.00	1.89*
Error	380	4.77	

*p < .05

***p < .001

into a given whole. Apparently, this process was stressful for both LA-Trait and HA-Trait patients, but especially for the latter.

The HA-Trait patients seemed to experience greater elevations in A-State as they progressed through the EIWA subtests whereas the A-State level of LA-Trait patients did not show any systematic change from the beginning to the end of the EIWA. In order to evaluate these trends, an analysis of the Short Form A-State scores for the first three and the last three EIWA subtests was carried out. The mean A-State scores for the first three and last three EIWA subtests are presented in Figure 2. These data were analyzed in a 2 by 2 analysis of variance in which A-Trait and first $vs.$ last EIWA subtests were the independent variables. The significant A-Trait by Subtests interaction ($F = 3.81$, $df = 1.38$, $p < .05$) indicated that the HA-Trait patients showed a greater increase in A-State intensity during the EIWA than the LA-Trait patients. Further analysis indicated the A-State scores of the HA-Trait patients were significantly
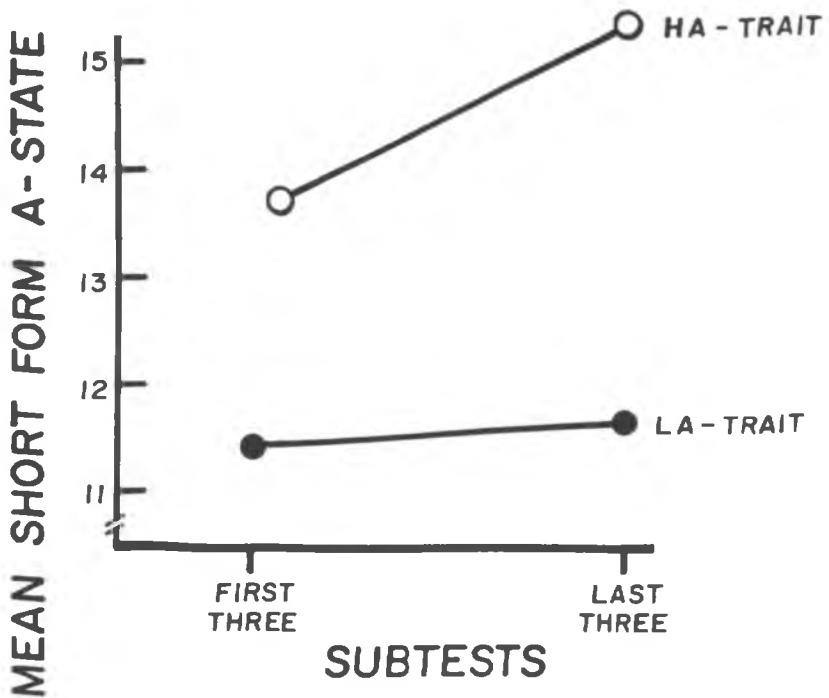

Figure 2. The mean STAI Short Form A-State scores of the HA-Trait and LA-Trait patients for the first three and last three EIWA subtests.

higher during the last three EIWA subtests than for the first three sub-tests, whereas there was no difference in the A-State scores for the LA-Trait patients.

The Relation Between the Measures of Anxiety and Intelligence

The correlations of each of the EIWA subtests with A-State-1, the Short Form A-State scales given after each subtest, A-State-2, and A-Trait scores are presented in Table 4. Perhaps the most important finding that should be noted in this table is that the Short Form A-State scales correlated more highly with the EIWA subtest scores than the other anxiety measures. Scores on the A-Trait scale and on A-State-2 were also highly correlated with preformance on the EIWA, but A-State-1 only correlated significantly with two of the EIWA subtests.

The findings that scores on A-State-2 correlated higher with performance than A-State-1 would appear to indicate that the anxiety reported during a test has more influence on performance than the feelings of tension and apprehension experienced prior to taking the test. These findings also suggested that performance on a particular EIWA subtest is best predicted by a measure of anxiety taken immediately after that subtest.

Digit Span is often regarded as the best indicant of anxiety among the WAIS subtests (Wechsler, 1958). Block Design, a timed subtest, has also been shown to be anxiety evoking (Morris & Liebert, 1969; Siegman, 1956). For the total sample in the present study, Block Design and Digit Span evoked high levels of A-State, as may be noted in Figure 2, and scores on the Block Design subtest correlated more highly with the Short Form A-State scores than did any other subtest ($r = -.59$). While the inverse relation between Digit Span and the Short Form A-State scale was not quite as large, it was highly significant ($r = .47, p < .01$). These findings provide support for Schafer's (1948) contention that "the most conspicuous features of an anxiety state," as reflected in performance on the WAIS, are ". . . impaired attention (Digit Span), a less markedly but still noticeable impaired concentration (Arithmetic) . . . and the impaired ability to plan and later to check for accuracy the Block Designs and Object Assemblies" (p. 43).

It is generally assumed that the Wechsler Vocabulary subtest is not impaired by anxiety (Rapaport, Gill & Schafer, 1968). The finding in the present study that the Vocabulary subtest did not correlate significantly with the anxiety measures was consistent with this assumption, and provides justification for the practice of using the Vocabulary subtest as the comparison standard in scatter analysis of WAIS profiles. Analogies was

TABLE 4

Correlations of EIWA Subtest Scores with the
Short Form A-State Scales and the STAI
A-State-1, A-State-2, and A-Trait Scores

EIWA Subtests	Short Form A-State Scales	A-State-1	A-State-2	A-Trait
Information	-.37*	-.16	-.39**	-.38*
Comprehension	-.39**	-.35*	-.36*	-.43**
Arithmetic	-.33*	-.13	-.15	-.31*
Analogies	-.25	-.04	-.15	-.19
Digit Span	-.47**	-.19	-.36*	-.26
Vocabulary	-.26	-.04	-.15	-.27
Digit Symbol	-.41**	-.25	-.36*	-.38*
Picture Comp.	-.39**	-.23	-.30*	-.29
Block Design	-.59**	-.34*	-.43**	-.46**
Picture Arrg.	-.53**	-.27	-.41**	-.35*
Object Assb.	-.33*	-.19	-.27	-.29

*$p < .05$

**$p < .01$

the only other WAIS subtest that did not correlate with the Short Form A-State scale.

The correlation coefficients between STAI A-Trait, A-State-1, and A-State-2 scores with the EIWA Full Scale, the Verbal and Performance Scales, the Wechsler Triad, and with the Timed and Untimed EIWA subtests are reported in Table 5. The magnitude of the negative correlation between the STAI A-Trait scale and the various EIWA measures was greater than for either of the A-State measures. While the correlations of A-State-2 with the EIWA were almost as high as for the A-Trait scale, the correlations of A-State-1 and the EIWA were considerably lower, and

TABLE 5

Correlations Between the STAI
A-Trait, A-State-1, and A-State-2
With the EIWA Full Scale, Verbal
and Performance Scale Scores,
and With the Triad, Timed, and Untimed
Subtest Scores

	A-Trait	A-STATE-1	A-STATE-2
Full Scale	-.43**	-.24	-.39**
Verbal	-.36*	-.20	-.31*
Performance	-.45**	-.25	-.45**
Triad	-.38*	-.23	-.34*
All Timed	-.43**	-.29	-.38**
All Untimed	-.36*	-.18	-.33*

*p $<$ .05

**p $<$ .01

none of these correlations were statistically significant. It may also be noted in Table 5 that the A-Trait and A-State-2 scores correlated most highly with the EIWA Full Scale and Performance IQ scores, and with the Timed subtests.

In summary, the prediction that measures of state and trait anxiety would be inversely related to performance on the EIWA was confirmed for the EIWA Full Scale. Verbal, and Performance IQ scores, the EIWA Triad, the Timed and Untimed EIWA subtests, and for each individual EIWA subtest, with the exception of Analogies and Vocabulary. The highest correlations between measures of anxiety and intelligence were obtained for the Short Form A-State scales given immediately after each EIWA subtest, and Block Design was the single best indicator of state anxiety on the EIWA. The STAI A-Trait scale given prior to the EIWA was also a reasonably good predictor of the level of state anxiety experienced during testing, as well as performance on most of the EIWA subtests and derived measures.

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