DOCUMENT RESUME

ED 060 057 TM 001 143

AUTHOR Stallings, William M.
TITLE The Predictive Validity of the Torrance Figural Test (Form B) of Creative Thinking in the College of Fine and Applied Arts.
INSTITUTION Illinois Univ., Urbana. Office of Instructional Resources.
SPONS AGENCY Office of Education (DHEW), Washington, D.C.
REPORT NO RR-309
PUB DATE Nov 69
CONTRACT OEC-3-7-061174-02
NOTE 16p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Analysis of Variance; Architecture; Art; *College Freshmen; Correlation; *Creativity Tests; Grade Point Average; *Grade Prediction; *Liberal Arts; Multiple Regression Analysis; Music; Originality; *Predictive Validity; Sex Differences; Statistical Analysis; Test Validity
IDENTIFIERS American College Testing Program; *Torrance Figural Test of Creative Thinking

ABSTRACT

In an effort to improve the predictability of course grades in the College of Fine and Applied Arts the Torrance Figural Test (Form B) of Creative Thinking was administered to entering 1968 freshmen. Four figural creativity variables (Fluency, Flexibility, Originality, and Elaboration) were correlated with course grades, American College Testing Program scores, sex, and first semester grade-point-averages. Only one out of 100 correlation coefficients computed was statistically significant. In a multiple discriminant function, the creativity scores did differentiate among Architecture, Art, and Music curricular groupings. Nevertheless, it was concluded that this test appears to have no utility in enhancing the prediction of course grades. (Author/MS)

research report #

research report

The Predictive Validity of the Torrance Figural Test (Form B) of Creative Thinking In the College of Fine and Applied Arts[1]

by

William M. Stallings

Measurement and Research Division
Office of Instructional Resources
University of Illinois

November 1969

[1]This study was supported in part by Project 6-1174, Contract OEC-3-7-061174-02, U. S. Office of Education

measurement and research division
office of instructional resources
university of illinois
urbana, illinois

ABSTRACT

In an effort to improve the predictability of course grades in the College of Fine and Applied Arts at the University of Illinois (Urbana-Champaign), the Torrance Figural Test (Form B) of Creative Thinking was administered to entering 1968 freshmen. Four figural creativity variables (Fluency, Flexibility, Originality, and Elaboration) were correlated with course grades, American College Testing Program scores, sex, and first semester grade-point averages. Only one correlation coefficient, from the 100 computed, was statistically significant ($p < .05$). In a multiple discriminant function, the creativity scores did differentiate among Architecture, Art, and Music curricular groupings. Nevertheless, it was concluded that the Torrance Figural Test (Form B) of Creative Thinking appears to have no utility in enhancing the prediction of course grades in the College of Fine and Applied Arts.

For the past three years entering University of Illinois freshmen have been required to participate in a "College Diagnostic Testing Program." A central purpose of this program has been to improve the prediction of course grades and of overall grade-point averages (GPA) within colleges.

Perhaps the unit, for which the prediction of course grades and GPA has proved most refractory, is the College of Fine and Applied Arts (FAA). For example, Bowers (1963) has presented data comparing the predictability of first semester GPA's, by college, at the University of Illinois. FAA had the lowest zero-order correlation between first semester GPA and American College Testing Program (ACT) Composite scores ($r = .30$). When high school rank, sex, and ACT Composite were used together in a multiple correlation, R was only .45. By contrast, the multiple correlation (with the same three predictors) for the colleges of Agriculture and Education was .65.

Previous attempts at improving the predictability of grades for FAA students have met with indifferent success. In one study, Stallings and Anderson (1968) used the Meier Art Test of Aesthetic Perception (Meier, 1963) and the unpublished Illinois Art Ability Test (see Cronbach, 1960) as predictors of grades for freshmen in all FAA curricula except Music. None of the 11 validity coefficients between the Meier Art Test of Aesthetic Perception and grades (and first semester GPA) was statistically significant ($p > .05$). Although not repor reported in the Stallings and Anderson (1968) study, those investigators did find two significant correlations ($p < .01$) between the Illinois Art Ability Test and course grades. The correlation of the

Illinois Art ABility Test with General Engineering 107 grades was .25 (N = 178); the correlation with ART 117 grades was .38 (N = 82). Also, the correlation between first semester GPA and the Illinois Art Ability Test was significant (N = 219, r = .23, $p < .01$).

In many studio art courses, offered by FAA, course grades are based upon the evaluations of art products by a faculty jury. Presumably, these evaluations include a judgement of the student's exhibited creativity as well as his technical competence. One might assume that the creative component is also considered in assigning grades in musical performance courses, architecture and landscape architecture courses, dance, theater, and (possibly) advanced urban planning courses. Thus, one might expect to find some relationship between a measure of creativity and achievement in those courses in which creativity is explicitly considered.

Although supporting empirical evidence may be weak (see Wallach, 1968), creativity, as a psychological construct, is usually considered to be somewhat independent of intelligence. The definition of creativity offered by Torrance (1966a) has much in common with the usual definitions of intelligence.

> A process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on: identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results (p. 6).

This definition does have the virtue of being applicable in a wide range of human activities. As operationally defined in the Torrance

Tests of Creative Thinking, however, the generalizability of creativity may be restricted.

Nevertheless, it was hoped that a measure of creativity might enhance the prediction of grades in FAA. Moreover, a measure of figural creativity seemed more promising than measures of verbal creativity (verbal creativity and general intelligence or ability appear to be highly correlated). Thus, at the beginning of the 1968 fall semester about 350 entering freshmen in the College of Fine and Applied Arts (FAA) were administered the Figural Test (Form B) of the Torrance Tests of Creative Thinking (Torrance, 1966b). The completed tests were returned to Personnel Press for scoring by Torrance-trained judges. In addition to scores on the Torrance test, course grades, first semester grade-point averages, sex, and five ACT scores were available for most of the subjects.

Description of the Instrument

In the Torrance Test of Creative Thinking, Thinking Creatively with Pictures (Form B), scores on the four figural variables are derived from an analysis of responses to three activities. The four variables are:

> fluency, the number of relevant responses offered; flexibility, the number of spontaneous shifts from one category to another; orginality, the relative infrequency of the responses offered; and elaboration, the detail and specificity of the responses (Wallach, 1968, p. 274).

The prefex "figural" is understood to be attached to each of the four variables.

As mentioned previously, there are three activities or items in Thinking Creatively with Pictures (Form B). The following descriptions of these three scales are drawn from the Norms-Technical Manual: Research Edition (Torrance, 1966a).

1. Picture Construction Activity

> The Picture Construction Activity is an original one devised by the author [Torrance]. Subjects are required to think of a picture in which the given shape made of colored paper with an adhesive backing . . . is an integral part. An effort is made to elicit an original response by asking subjects to try to think of something that no one else in the group will produce. Elaboration is encouraged by the instructions to add ideas that will make the picture tell as complete and as interesting a story as possible. Thus, the product is evaluated only for originality and elaboration (p. 14).

2. Incomplete Figures Activity

Ten incomplete figures form the stimuli for this task (one example consists of two parallel lines; some others are less geometrical). "Each figure is scored for flexibility, originality, and elaboration (Torrance, 1966a, p. 14)."

3. Repeated Figures Activity

In Form B the stimulus material for the Repeated Figures Activity consists of 40 circles with the following instructions (Torrance, 1966b):

> In ten minutes see how many objects or pictures you can make from the circles below and on the next page. The circles should be the main part of whatever you make. With pencil or crayon add lines to complete your picture. You can place marks . . . wherever you want in order to make your picture. Try to think of things that no one else will think of. Make as many different pictures or objects as you can and put as many ideas as you can in each one. Make them tell as complete and as interesting a story as you can. Add names or titles below the objects.

As may be inferred from the instructions, Fluency, Flexibility, Originality, and Elaboration scores are derivable from this task.

Results

Validity coefficients (generated by a missing data routine) relating the four figural creativity variables and various criteria are reported in Table 1. Only one correlation, of the 100 generated, was significant at the .05 level. Indeed, one might have expected more statistically significant relationships if chance alone were operating. The one statistically significant ($p < .05$) correlation between Elaboration and first semester GPA was so small that only 1.44 percent of the variation in GPA could be explained by a knowledge of Elaboration.

In a step-wise multiple regression routine with first semester GPA as the criterion and five ACT scores (English, Mathematics, Natural Science, Social Science, and Composite) and the four Torrance figural scores as predictors, the first variable entered was ACT English, the second was ACT Natural Science, and the third was Torrance Originality. The zero-order correlations of these three predictors were .26, .28, and .29 respectively. However, the incremental increase in R (.02) obtained by adding ACT Natural Science was insignificant ($F = 3.72$; $df = 1,280$; $p > .05$). Moreover, the incremental increase in R (.03) obtained by adding <u>both</u> ACT Natural Science and Originality to ACT English in the predictive battery was also insignificant ($F = 2.95$; $df = 2,278$; $p > .05$). The statistical test employed in these analyses is found in McNemar (1962, p. 284).

Intercorrelations among the figural scores are presented in Table 2. It would seem that Fluency and Flexibility are measuring the same variable. The other two, Originality and Elaboration, may be somewhat independent.

A multiple discriminant analysis and a multivariate analysis of variance (MANOVA) were performed to determine whether the three largest curricula groups (Architecture, Art, and Music) in FAA could be distinguished on the basis of the four figural creativity variables. A preliminary test of the homogeneity of dispersion matrices [similar, in intent, to the homogeneity of variance test used in analysis of variance] resulted in a significant F ($F = 1.63$; $df = 20, 191, 578$; $p \leq .05$). This test is found in Cooley and Lohnes (1962, p. 62-63). Because the hypothesis that the dispersion matrices were homogeneous was rejected, the multivariate analysis of variance results may be somewhat suspect. Nevertheless, the hypothesis that the group centroids (means of the three curricular groups on the four figural variables) were equal was rejected (Wilk's Lambda = .89; $F = 5.02$; $df = 8,640$; $p < .05$). Means and standard deviations of the figural creativity variables, by curricular grouping, are shown in Table 3. Interestingly, all univariate analyses of variance, comparing the three curricula groups on the figural variables one at a time, were significant (for Fluency, $F = 3.25$; $df = 2,323$; $p < .05$: for Flexibility, $F = 5.15$; $df = 2,323$; $p < .05$: for Originality, $F = 3.28$; $df = 2,323$; $p < .05$: for Elaboration, $F = 5.07$; $df = 2,323$; $p < .05$).

Perhaps the most important results from the multiple discriminant analysis are given in Table 4. Two discriminant functions sufficed to account for almost all of the discriminating power of the test battery. Of these, the first function (whose weights are labeled I in Table 4) was the most important. This importance is illustrated in Figure 1 in which group centroids are plotted in two dimensional discriminant space (number pairs were obtained by postmultiplying the transpose of the normalized vector matrix--as reported in Table 4--by the group centroid matrix--as presented in Table 3). However, both discriminant functions were significant (for I, $\chi^2 = 397$, df = 8, $p < .01$; for II, $\chi^2 = 19$, df = 3, $p < .01$). Supposedly, the scaled vectors ". . . show the relative contributions of the variables to the discriminant function" (Cooley and Lohnes, 1962, p. 118). If this is so, Flexibility and Elaboration are most important in the first discriminant function (I) and Fluency and Flexibility are most important in the second discriminant function (II).

Discussion

It is a rare occurrence in educational research when only one percent of a large number of validity coefficients (using grades and ability measures as criteria) is statistically significant. Perhaps as a rationalization, Torrance (1966a) has cautioned that:

> Although many investigators have sought to validate the Torrance Tests of Creative Thinking and similar instruments by correlating scores derived from them with measures of educational achievement, there are many reasons for not expecting high correlation between creativity variables and educational achievement variables (p. 47).

This explanation might be more palatable had not Torrance chosen a de definition of creativity so similar to the usual definitions of intelligence. Moreover, Torrance (1966a) himself has suggested that:

> If measures of achievement took into consideration creative applications of information and other kinds of creative achievement and/or subject matter were acquired in creative ways, one could expect high correlations between creative thinking measures and achievement (p. 47).

In an earlier section of this paper, it was noted that, in many FAA grades, creativity is considered. Nonetheless almost all the validity coefficients are within the chance range.

One might ask whether there were statistically significant relationships between grades and figural creativity variables over and above the relationships between grades and scholastic aptitude (as measured by the ACT tests). A tentative answer is available. After ACT English had been partialed out, the one significant correlation (Elaboration and first semester GPA) was reduced from .117 to .094.

In summary, the Torrance Figural Tests of Creative Thinking seem to have no utility in enhancing the prediction of course grades in the College of Fine and Applied Arts. Although the tests seem to discriminate among curricular groups, it is highly likely that a suitable combination of ACT scores could do at least as well. Thus, it appears that nothing can be gained in improved prediction from the use of the Torrance Figural Tests of Creative Thinking.

REFERENCES

Bowers, J. The prediction of scholastic achievement for semester I, 1962-1963 freshmen at the University of Illinois at Urbana. Research Memorandum 63-5, Office of Admissions and Records, University of Illinois, Urbana, June, 1963. (Mimeographed)

Cooley, W. W. & Lohnes, P. R. Multivariate procedures for the behavioral sciences. New York: Wiley, 1962.

Cronbach, L. J. Essentials of psychological testing, (2nd ed.) New York: Harper, 1960.

McNemar, Q. Psychological statistics (3rd ed.) New York: Wiley, 1962.

Meier, N. C. Meier art aesthetic perception test. Iowa City, Iowa: Bureau of Educational Research and Service, University of Iowa, 1963.

Stallings, W. M. & Anderson, F. E. A note on some characteristics and correlates of the Meier Art Test of Aesthetic Perception. Research Report 281, Measurement and Research Division of the Office of Instructional Resources, University of Illinois, Urbana, 1968. (Mimeographed)

Torrance, E. P. Torrance tests of creative thinking: Norms - Technical manual. Princeton, New Jersey: Personnel Press, 1966 (a).

Torrance, E. P. Thinking creatively with pictures (test booklets and manuals, Form A and Form B). Princeton, New Jersey: Personnel Press, 1966 (b).

Wallach, M. A. Review of E. P. Torrance, Torrance tests of creative thinking. American Educational Research Journal, 1968, 5, 272-281.

Table 1

VALIDITY COEFFICEINTS OF TORRANCE FIGURAL TEST (FORM B) OF CREATIVITY SCORES AND VARIOUS CRITERIA

Criteria	Figural Predictor Variables				
	FLUENCY	FLEXIBILITY	ORIGINALITY	ELABORATION	N
Sex	.111	.095	.067	.075	301
Art 113 Grade	.145	.191	.146	.184	84
Art 117 Grade	.035	-.057	.069	.150	84
Art 119 Grade	.127	.049	.032	.127	84
Art 121 Grade	.021	-.058	.052	.183	81
Art 181 Grade	-.019	-.076	.103	.137	147
Music 101 Grade	-.174	-.166	.222	.056	57
Music 106 Grade	-.811	-.965	-.971	.756	3
Music 110 Grade	-.085	-.086	.090	.116	44
Music 166/167 Grade	.911	.850	.183	.874	4
Music 180 Grade	.053	.056	-.022	.287	37
Music 181 Grade	-.034	-.098	.166	.052	25
Land. Arch. 101 Grade	.630	.754	.090	.386	5
Land. Arch. 122 Grade	---	---	---	---	0
Land. Arch. 131 Grade	.322	.464	.503	-.180	5
Math. 122/123 Grade	-.092	.022	-.011	-.112	110
Math. 111/112 Grade	.127	.235	.197	-.088	34
G. E. 107 Grade	.109	.123	-.031	.086	144
Arch. 101 Grade	.064	.107	.120	.034	48
Ur. Plan. 171 Grade	---	---	---	---	---
1st Semester G.P.A.	.062	.082	.086	.117*	301
ACT English	.089	.086	.027	.103	282
ACT Math	-.107	-.042	.041	.055	282
ACT Social Science	.020	.009	.015	.078	282
ACT Natural Science	-.037	-.075	.065	.081	282
ACT Composite	-.014	-.008	.050	.102	282

* $p < .05$

Table 2

INTERCORRELATIONS OF TORRANCE FIGURAL TEST (FORM B)

OF CREATIVITY SCORES

(N = 301)

Variable	2.	3.	4.
1. Fluency	.895	.254	.409
2. Flexibility		.260	.358
3. Originality			.256
4. Elaboration			

Table 3

TORRANCE FIGURAL TEST (FORM B) OF CREATIVITY:

MEANS AND STANDARD DEVIATIONS OF FOUR VARIABLES FOR THREE CURRICULA

Variable	Architecture N = 167	Art N = 84	Music N = 75
		Group Means	
1. Fluency	13.15	13.10	15.00
2. Flexibility	11.05	10.58	12.73
3. Originality	19.22	21.90	17.61
4. Elaboration	62.21	69.75	56.64
		Group Standard Deviations	
1. Fluency	5.48	5.38	5.97
2. Flexibility	4.19	4.31	5.26
3. Originality	10.71	11.73	9.90
4. Elaboration	25.94	29.33	22.87

Table 4

TORRANCE FIGURAL TEST (FORM B) OF CREATIVE THINKING:

ROOTS AND VECTORS OF $W^{-1} A$

Variables	Normalized Vectors		Scaled Vectors	
	I	II	I	II
1. Fluency	.1028	.8399	10.2989	84.1388
2. Flexibility	-.9703	-.5349	-78.2145	-43.1192
3. Originality	.1844	.0911	35.8074	17.6899
4. Elaboration	.1180	.0074	55.5804	3.4706

Latent Roots	Percent of Trace
λ_1 = .1229	95.3920
λ_2 = .0059	4.6081
λ_3 = .0000	0.0000
λ_4 = .0000	0.0000

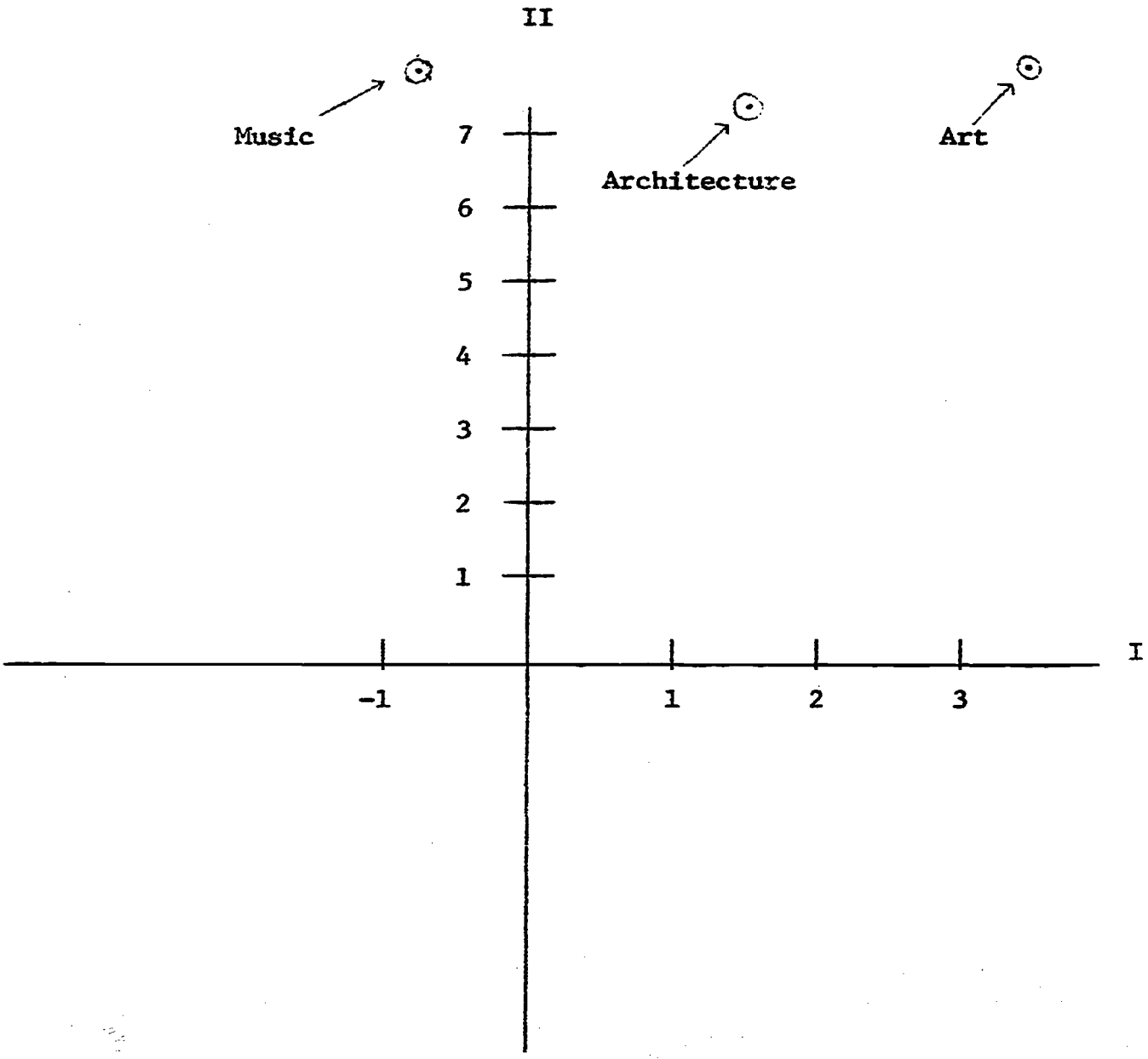

Figure 1. Architecture, Art, and Music centroids in the discriminant space derived from four Torrance Figural Test (Form B) of Creative Thinking variables. These variables are Fluency, Flexibility, Originality, and Elaboration.