

## TWIN RESEMBLANCES IN CREATIVITY AND IN ESTHETIC AND EMOTIONAL EXPRESSION

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*Three sources of observation relevant to the measurement of individual differences in emotional and esthetic expressiveness were employed to study their heritability by application to a sample of some 60 pairs of young adult like-sexed twins, approximately evenly divided between male and female and MZ and DZ pairs. The sources of observation were objective test performances, trait ascription using a standard list of adjectives, and videotaped enactments of mood and esthetic performances. Perceptual and esthetic abilities do appear to have substantial heritability, although esthetic preferences do not. Heritability is also indicated for such adjectives as artistic, inventive, original, and independent. Ratings of the videotape performances yielded somewhat ambiguous results, due to the presence of a marked halo effect; the most likely interpretation congruent with earlier results is that greater MZ twin resemblances in social extroversion generated greater resemblances in the videotape situation on such other trait-rating variables as creativity, naturalness, and dominance.*

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### INTRODUCTION

In two earlier studies of twin resemblances in creativity, one of us (Barron 1972) found that verbal measures of creativity showed very high similarity for both MZ and DZ pairs. Two measures based on perceptual responses to visual displays and known from other studies to be related to creativity did produce significant heritabilities, however. This led Barron to suggest that twinship as an environment, in which propinquity could enhance the role of imitation, would be more likely to influence verbal behavior than purely visual discrimination and reasoning, which are largely silent and unobserved because of their infrequently identified practical consequences and a lack of social need for their expression. He proposed that the latter problem might be studied through analysis of trait ascriptions within twin pairs, as well as by enlarged observation of expressive behavior. The present study is an outgrowth of that line of reasoning.

### SAMPLING AND PROCEDURES

The sample consisted of 61 pairs of like-sexed Italian twins, born and raised in Rome. There were 36 MZ and 25 DZ pairs in the initial testing, at which time the age range was 18 to 25, with a mean of 20.5. Additional data were gathered on a second occasion, some three years later, at which time nearly 50% of the original sample was not available for testing; the reduced sample consisted of 32 pairs, 20 MZ and 12 DZ. They were approximately equally divided between male and female. An analysis of results is presented in Table 1 for tests on both occasions.

The following tests were administered:

1. *The Gough-McGurk Perceptual Acuity Test*

This test consists of 30 problems, each of which presents several geometric forms or figures in combination. Twenty-five illusion and five non-illusion problems are included. The illusion items were developed from well-known illusions, such as the Muller-Lyer, the Poggendorf, Sander's, Ponzo's and Delbouf's illusions, Titchener's circle, and the vertical-horizontal parallelogram. The problems are presented on slides, and an answer sheet with a multiple-choice test format is used, with five options offered for each problem. A weighted scoring system based on closeness to the correct judgment is employed. Test norms are constant across cultures and scores show a monotonic increase with age. Split-half reliability is 0.70.

2. *Gottschaldt Figures (Crutchfield Revision)*

This test measures the ability to locate simple geometrical figures embedded in more complex figures. The task is to break apart a strong perceptual organization in order to isolate a required part. The test consists of two sets of ten figures each; its split-half reliability is greater than 0.90.

3. *Franck Drawing Completion Test*

This test consists of 36 two-by-two inch squares, in each of which is inscribed a simple figure, such as a semi-circle, or two parallel lines, or interlocking S-curves. The instructions are: «These are incomplete drawings; please complete them. Do it any way you like; use one line or more. Do it the way it seems most fun, or is enjoyable to you». Each completed drawing is rated for Originality, Complexity, Expressiveness and Quality of Drawing. Interjudge agreement averages 0.80.

4. *Irvin Child Test of Esthetic Judgment*

This test consists of 100 pairs of slides showing works of art. The two pictures in a pair are similar in kind or in subject matter, but one is superior esthetically in the opinion of expert judges. Split-half reliability is on the order of 0.80.

5. *The Barron M-Threshold Inkblot Test*

This test consists of 26 slides showing inkblots in a graduated series based on the evocative power of the blots for the human movement percept. The respondent is asked to write down the first interpretation of each blot that comes to mind. These are then scored for presence of human movement in the reported perception. The test is thus a measure of readiness to perceive human movement in inkblots; the ordinal number of the blot in which human movement is first seen defines the individual's threshold. A score for Volume is also obtained (simply a count of the number of human movement responses).

6. *The Barron-Welsh Art Scale*

This test consists of 62 line drawings, presented in a booklet with instructions to indicate for each drawing whether one likes it or dislikes it. The test is scored to reflect agreement of the respondent with the opinion of artists. Both test-retest and split-half reliability exceed 0.90.

7. *The Gough Adjective Check List*

This test is a list of 300 trait-descriptors in adjective form. The list provides a broad sampling of traits thought to have stability over time. The respondent is asked to check those adjectives that describe himself.

8. *Expressive Behavior Sample*

In this procedure, the expressive behavior of the twins was videotaped as they performed such actions as singing a song, completing a drawing, and simulating behavior in various moods, such as anger, sadness, happiness, distress, delight. While all the preceding tests were administered in groups, in this procedure Ss were observed singly. Two tapes, each consisting of 29 individuals none of whom was one another's twin, resulted. The tapes were then viewed by four raters, all of them highly trained psychiatrists or psychologists, who used a set of ten rating variables to describe each subject individually. The raters were not informed that they were rating twins, and had no inkling that they might be doing so until they began rating the second tape. Oddly enough, most of the raters spontaneously assumed that they were taking part in a study of the reliability of rating from videotapes.

The variables rated from the videotapes were: (1) Introversion; (2) Ability to Communicate; (3) Esthetic Sense; (4) Grace; (5) Naturalness; (6) Expansiveness; (7) Creativity; (8) Flexibility; (9) Dominance; (10) Amount of Verbalization.

## RESULTS AND DISCUSSION

1. *Analysis of Test Measures*

As shown in Table 1, for each of the test variables, intraclass correlation coefficients have been calculated in both the MZ and the DZ twin series. Whenever feasible, heritability estimates have thus been derived. Both Holzinger's  $H$  and Falconer's  $h^2$  statistics have been used, so that the more likely heritability estimate should lie in between.

Table 1. *Heritability estimates for test-measured traits in twins*

Test variable	MZ pairs		DZ pairs		Heritability estimates	
	n	r	n	r	Holzinger's $H$	Falconer's $h^2$
1. Gottschaldt Figures	36	0.76	25	0.29	0.66	0.94
2. Barron-Welsh Art Scale	36	0.16	25	0.29		
3. Child Esthetic Judgment Test	35	0.57	24	0.69		
4. Perceptual Acuity Test	34	0.44	23	—0.24		
5. Originality (rated from Franck Drawing Completion Test, FDCT)	18	0.64	10	0.07	0.61	1.14
6. Complexity (rated from FDCT)	18	0.64	10	0.51	0.27	0.26
7. Expansiveness (rated from FDCT)	18	0.71	10	0.46	0.46	0.50
8. Quality of Drawing (rated from FDCT)	18	0.65	10	0.06	0.63	1.18
9. Threshold for Human Movement (Barron Inkblots)	21	0.73	11	0.31	0.61	0.84
10. Volume of Human Movement (Barron Inkblots)	21	0.75	11	0.19	0.69	1.12

$\bar{n}$  = number of twin pairs;  $r$  = intraclass correlation coefficient;  $H = (r_{MZ} - r_{DZ}) / (1 - r_{DZ})$ ;  $h^2 = 2(r_{MZ} - r_{DZ})$ .

Relatively high heritability estimates are found for the Gottschaldt Figures and the Originality ratings of production on the Franck Drawing Completion Test. The human-empathic response to the M-Threshold Inkblots also show high heritability estimates of the same magnitude, which in all these cases exceed 0.60 and are probably much higher.

Neither the Barron-Welsh Art Scale nor the Child Esthetic Preference Test appear to show a zygoty effect. Esthetic *preference*, as distinct from *perceptual* and *esthetic performances*, would not appear to be much related to genetic factors.

These results should however be considered with caution, due to the small size of the sample.

2. *Trait Ascriptions on the Adjective Check List*

A simple chi square statistic was computed for each adjective for each pairwise comparison of ACL profiles. This statistic was used to test a null hypothesis whose rejection would enhance the alternative hypothesis that a greater proportion of DZ twin pairs (in the case of cross twin comparisons) or DZ twins (in the case of comparing two ACL profiles completed by one person) disagreed on the applicability of that adjective than did MZ pairs or MZ twins. It should be noted that agreement may occur in two ways (both check or neither check); disagreement occurs when the adjective is checked on one profile and not on the other.

Once it was determined that an adjective had achieved significance ( $p > 0.05$ ), Holzinger's  $H$  was

Table 2. Heritability estimates for rating of Expressive Behavior from videotapes in twins\*

Test variable	Intraclass correlation coefficient ( <i>r</i> )		Heritability estimates	
	MZ twin pairs	DZ twin pairs	Holzinger's <i>H</i>	Falconer's <i>h</i> <sup>2</sup>
1. Introversion	0.60	0.22	0.487	0.76
2. Ability to Communicate	0.20	— 0.20		
3. Esthetic Sense	0.40	0.44	0.333	0.40
4. Grace	0.37	0.38		
5. Naturalness	0.45	— 0.18		
6. Expansiveness	0.60	0.40		
7. Creativity	0.57	— 0.02	0.469	0.90
8. Flexibility	0.50	0.56		
9. Dominance	0.49	0.04		
10. Amount of Verbalization	0.52	0.69		

\* The ratings were averages of those made by five psychiatrically trained judges who watched the videotaped performances of 29 twin pairs (17 MZ, 12 DZ).

computed. These estimates should be interpreted cautiously because of the dichotomous nature of the dependent variable. The probabilities associated with the various intraclass correlations are not reported.

Due to the small sample size the sex classification was collapsed for the item analysis.

The item analysis produced five items with sufficiently substantial heritabilities to take note of. These were: *forgetful* (0.83), *artistic* (0.67), *honest* (0.62), *informal* (0.465), and *wary* (0.465). For our present concerns, the emergence of the adjective *artistic* is of course of most interest. The results must be accepted with caution, however, for the *set qua set* of 300 adjectives did not show the expected zygoty effect; an index of profile similarity was not significantly different for MZ and DZ pairs. (A fuller analysis of observations made through application of the Adjective Check List in the present study may be found in a paper by J. Dwyer, F. Barron, and P. Parisi, available from the Laboratory for the Psychological Study of Lives, University of California, Santa Cruz).

### 3. Ratings of Expressive Behavior

The results of the trait ratings by psychiatrists from the videotaped behavior samples are shown in Table 2. These results cannot be interpreted at face value, however, as a pronounced halo effect was present in the ratings. It is quite possible that they are mediated entirely by a factor involving spontaneity, or social ease and lack of anxiety in the videotaping situation. Nonetheless, whatever is behind the results, there is clearly much greater similarity of MZ than of DZ twins to one another. The data do not allow a decision between creativity and a general factor of social extroversion as the chief mediating factor.

Some support for the social extroversion interpretation may be found in the results of other twin studies in which sociability or some aspect of social extroversion was measured. The Adjective Check List was used by Scarr (1966) in a trait-ascription format in which the mothers of 28 pairs of DZ twins and 24 pairs of MZ twins were asked to describe each of their twin daughters with this instrument. The heritability of each of 19 scales was estimated with Holzinger's *H*. The most substantial genetic component was found for *need-affiliation*; the DZ correlation was significant, but the MZ correlation was much higher (0.83), leading Scarr to infer "a major genetic influence for sociability" (Scarr 1966, p. 356).

These ACL results with twin girls tend to support previous findings with other personality tests. Gottesman (1963) reported a heritability of 0.60 for his female adolescent twins on the Social Introversion scale of the MMPI. An even greater heritability was found for males (0.84). Gottesman (1963) argued that the sex differences may be due to less environmental pressure for sociability in males. These heritability coefficients are congruent with those reported by Eysenck (1956) for his introversion-extroversion scale (0.61) with a small sample of males and females.

A high heritability for anxiety has been found by Eysenck and Prell (1951), Slater (1953), Shields (1954), and Gottesman (1963) in twin studies of both sexes. The authors of a methodologically sophisticated reanalysis of data collected during the past two decades (Jinks and Fulker 1970) concluded that genes account for about two-thirds of the variance in social extroversion.

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