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FACTOR STRUCTURE OF THE FIGURE-DRAWING TEST

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The Figure-Drawing Test was administered to 788 male Caucasian Johns Hopkins medical students. The tests were scored by slightly modified versions of the Jones and Thomas (1964, 1965) technique for scoring structural and graphic characteristics plus the sophistication-of-body-concept scale ratings of Witkin (Witkin et al, 1962; Thomas, 1966). From these data 10 independent factors which accounted for a substantial proportion of the variance associated with the 57 figure-drawing variables used were factor analytically identified. Six of these factors are related to descriptive characteristics of the drawings, e.g., sophistication and nudity. Two of the factors are related to graphic characteristics of the drawings, or techniques used in drawing the figures, such as the degree of line pressure. The final 2 factors are related to how the figures were positioned on the page.

The Draw-A-Person or Human Figure-Drawing Test is a projective personality assessment device frequently used by psychologists and psychiatrists in conjunction with other projective devices such as the Rorschach Test. The test is almost completely unstructured. The subject is provided with a standard-sized sheet of paper and is simply asked to draw an entire person (not a stick-figure). Having done so, he is provided with additional paper and asked to draw another person opposite in sex from that of the first. The clinician views these figures as being a projection of the subject's personality and interprets them according to his own concepts and technique.

Before any interpretation can be considered objectively reliable, however, it is necessary that the figure drawings be scored in a reproducible fashion. Jones and Thomas (1964) developed a system in which the structural and graphic characteristics of the two figures resulting from the Figure-Drawing Test are scored in terms of a total of 43 descriptive variables plus 16 measurements. With their system, they were able to achieve an inter-judge agreement of nearly 94 percent in scoring 857 sets of drawings. Subsequently, to aid other users of the Figure-Drawing Test, they described their scoring system in detail (Jones & Thomas, 1965). In addition, to make the normative data on a healthy population of superior intelligence available, Thomas (1966) published a comprehensive atlas containing the figure-drawings of 870 medical students scored with the Jones and Thomas technique plus 8 variables adapted from the Witkin sophistication-of-body-concept scales (Witkin *et al.*, 1962).

In 1951, the Figure-Drawing Test was included in the battery of psychological tests administered to Johns Hopkins medical students participating in a longitudinal study designed to identify precursors of later disease states (Jones & Thomas, 1961). Starting with such a young population, it is obvious that some time must elapse before significant numbers of individuals have developed specific disease states. Although these figure-drawing data have been shown to be related to various biological characteristics of the individual (Thomas et al, 1968), no attempt has yet been made to relate them to the occurrence of disease conditions. Using other psychological data, however, some psychological precursors of certain disease conditions, e.g., malignant tumor, have already tentatively been identified (Thomas & Duszynski, 1974).

Prior to any systematic attempt to relate these figure-drawing variables to specific diseases, it seemed appropriate to reappraise the scoring technique. It is unlikely that each of the figure-drawing variables is an independent source of information, i.e., there probably is a substantial degree of overlap among the variables in terms of that which they measure. Therefore, the present investigation was designed to identify those independent factors which the Figure-Drawing Test is able to evaluate.

Methods

Procedures

The Figure-Drawing Test was routinely administered to those Johns Hopkins medical students in the graduating classes of 1952-64 who participated in the Precursors of Hypertension and Coronary Heart Disease Study. All tests were scored using the Jones and Thomas (1964, 1965) technique plus an adaptation of the Witkin et al. (1962) sophistication-of-body-concept scale. Some of these variables, though, are at the nominal level of measurement (Siegel, 1956), i.e., they are categorical variables. For purposes of the present investigation, however, it was necessary for all variables to be at least at the ordinal level of measurement. To meet this requirement, the figure drawings were rescored. The actual code for scoring these variables is shown in the Appendix. These variables represent rescaled and slightly expanded versions of the 43 descriptive variables of Jones and Thomas (1964, 1965) and the 8 sophistication-of-body-concept variables of Witkin _et al._, (1962). It was not possible to rescale the 16 measurements of Jones and Thomas (1964, 1965) sufficiently to meet the ordinal level of measurement.

Subjects

Only the 788 Causasian males (91% of participants in the Precursors Study) were considered as subjects in this study. The median age at the time of testing was 23; their age range was 20 to 36. Table 1 shows the means and standard deviations for each of the 57 variables, as well as the range of values which each varibles can assume.

Data Analysis

These figure-drawing data were analyzed by means of a factor analysis. Specifically, a principal-components analysis was performed on the intercorrelation matrix. The factors which resulted were then subjected to an orthogonal rotation using the varimax technique in order to increase their interpretability (Cooley and Lohnes, 1962).

Results

Initially, all factors having eigenvalues in excess of 1 were extracted from the intercorrelation matrix. This resulted in 16

TABLE 1

Figure-Drawing Test Scores

Figure-Drawing Variable	Mean	Sd	Possible Range
1. Stick Figure	.02	.15	0-1
2. Sex Sequence	.55	.80	0-2
3. Posture: Male	.14	.43	0-2
4. Activity: Male	.32	.69	0-2
5. Posture: Female	.20	.50	0-2
6. Activity: Female	.26	.59	0-2
7. Head-Body Concordance: Male	.26	.64	0-2
8. Position: Male	.63	.92	0-4
9. Head-Body Concordance: Female	.20	.57	0-2
10. Position: Female	.78	.97	0-4
11. Vertical Midline: Male	.95	.97	0-2
12. : Female	.29	.68	0-2
13. Bilateral Symmetry: Male	2.00	1.61	0-5
14. : Female	1.76	1.62	0-5
15. Horizontal Midline: Male	1.26	.96	0-2
16. Horizontal Midline: Female	1.09	.98	0-2
17. Omitted Appendages: Male	.26	.57	0-2
18. : Female	.34	.66	0-2
19. Visibility of Arms: Male	1.70	.51	0-2
20. : Female	1.56	.62	0-2
21. Position of Right Arm: Male	.71	.78	0-2
22. : Female	.70	.78	0-2
23. Position of Left Arm: Male	.72	.72	0-2
24. : Female	.76	.74	0-2
25. Position of Legs: Male	2.47	2.00	0-5
26. : Female	2.22	1.89	0-5

Table 1 (Continued)

27.	Figure Axis to Page Axis: Male	.11	.39	0-2
28.	: Female	.13	.39	0-2
29.	Lt/Rt Location on Page: Male	1.00	.80	0-4
30.	: Female	.99	.90	0-4
31.	Top/Bottom Location: Male	1.65	.95	0-4
32.	: Female	1.66	.95	0-4
33.	Quadrant Location: Male	.06	.24	0-1
34.	: Female	.07	.25	0-1
35.	Relative Size of Figures	1.66	1.66	0-4
36.	Constancy of Line Pressure: Male	.44	.50	0-1
37.	Degree of Line Pressure: Male	1.88	1.68	0-4
38.	Constancy of Line Pressure: Female	.36	.48	0-1
39.	Degree of Line Pressure: Female	1.84	1.64	0-4
40.	Continuity of Boundary: Male	1.08	1.49	0-4
41.	: Female	.94	1.40	0-4
42.	Body Shading: Male	.60	.49	0-1
43.	: Female	.71	.45	0-1
44.	Hair Shading: Male	1.53	.73	0-2
45.	: Female	1.74	.51	0-2
46.	Nudity: Male	1.43	.83	0-2
47.	: Female	1.36	.88	0-2
48.	Transparency of Figure: Male	.04	.19	0-1
49.	: Female	.07	.25	0-1
50.	Form Level: Male	2.33	1.40	0-4
51.	: Female	2.33	1.39	0-4
52.	Level of Detailing: Male	2.06	1.38	0-4
53.	: Female	2.03	1.34	0-4
54.	Identity and Sex Differentiation: Male	3.35	1.24	0-4
55.	: Female	3.43	1.15	0-4
56.	Overall Sophistication: Male	3.18	1.09	0-5
57.	: Female	3.18	1.07	0-5

TABLE 2

FACTOR ANALYSIS SUMMARY

Figure Drawing Variable*	Factor Loadings for Varimax Factor 1	2	3	4	5	6	7	8	9	10
M Form	.84									
F	.85									
M Detailing	.80									
F	.82									
M Identity	.75									
F	.73									
M Sophisticaton	.91									
F	.90									
M Position		-.84								
M Symmetry, bilateral		.79								
M Arm visibility		.76								
M Leg position		.78								
M Nudity			-.82							
F			-.82							
M Line pressure, degree				.78						
F				.77						
M Boundary continuity				.77						
F				.77						
M. Figure to page axis					.63					
F					.66					
M Rt. arm position						-.69				
F						-.66				
M Lt. arm position						-.72				
F						-.68				
M Top/bottom location							-.69			
F							-.68			
M Quadrant location							.63			
F							.58			
M Omitted appendages								.70		
F								.66		
F Position									-.81	
F Symmetry, bilateral									.78	
F Arm visibility									.80	
F Leg position									.75	
M Line pressure, constancy										.73
F										.72
Variance Accounted for by Factor (%)	12	6	5	5	4	4	4	4	6	3

Total Variance Accounted for = 53.0%

*M = Male; F = Female

factors which accounted for approxiamately 66 percent of the varicance associated with all 57 of the original variables. However since the first 10 factors were able to account for a substantial portion of the variance (53% of the total variance), only those 10 factors were rotated and considered further. In Table 2 those figure-drawing variables which contributed most heavily to the 10 factors are shown.

Before attempting to interpret these factors, some comments must be made. Statisticians differ in opinion as to whether it is more appropriate to perform a factor analysis starting with the intercorrelation matrix, as we have done in this paper, or to perform an image analysis (Kaiser, 1963). In the image analysis, the intercorrelation matrix is adjusted to reflect communalities among the variables. In consideration of these differing opinions, the figure-drawing data were also analyzed by means of an image analysis. Extracting those factors with eigenvalues greater than unity resulted in 8 factors which accounted for 72% of the common variance. However, since only 51% of the total variance was common, this indicates that they were able to account for just 37% of the total variance associated with all 57 figure-drawing variables. Using the technique described by Veldman (1967), the factors resulting from the factor analysis were compared to those from the image analysis. This comparison indicated that the two factor structures were very similar. Since substantially more of the total variance was accounted for by means of the factor analytic approach, only those 10 factors are reported.

In factor analysis, having identified some number of factors, it is generally considered desirable to interpret them, that is, to name them. Factor loadings, which are correlations between the original variables and the factors, are utilized for this purpose. The factor loadings represent the relative contributions of the original variables to the factors. In Table 2 those figure-drawing variables contributing most heavily to the 10 factors identified in the present investigation are shown with their respective factor loadings. From inspection of these loadings, Factor 1 appears to be a sophistication factor, i.e., it represents the degree of sophistication exhibitied by the individual's 2 figuredrawings. It should be pointed out that the global sophistication-of body-concept scales of Witkin et al., (1962) contributed most heavily to this factor. Factor 2 might be considered a male-figure perspective factor in that it represents the general position of the male figure as well as the perspective from which it is drawn. Factor 3 is a nudity factor, reflecting the degree of nudity in the drawings.

Factor 4 is a firmness and boundary factor, reflecting the firmness of line pressure and degree of line continuity in the boundaries of the figure drawings. Factor 5 is an orientation factor; it represents the orientation in which the figures are drawn in relationship to the major and minor axes of the page. Factor 6 is an arms position factor. Factor 7 is a location factor, representing where the figures are located on the page. Factor 8 is a completeness factor, representing the completeness of the figure drawings in the sense of whether or not appendages have been omitted. Factor 9 is a female-figure perspective factor, the female counter part to Factor 2. Finally, Factor 10 appears to be a constancy factor, primarily representing whether or not the figures are drawn with a relatively constant degree of line pressure.

Discussion

The Figure-Drawing Test, when scored as described, yields a total of 57 figure-drawing variables. In theory, the clinician or other user of the Figure-Drawing Test makes his overall assessment of the individual's personality by considering all 57 variables simultaneously. In actual practice, however, most users probably utilize only some subset of the variables in making their assessment simply because it is too unwieldly to consider such a large number of variables. But the problem is that unless the user is provided with an indication of the relative importance of the variables, he has no idea (except intuitively) which subset of variables might be the most meaningful to consider. To complicate matters further, there is in all likelihood a considerable degree of redundancy among the variables in terms of that which they measure, i.e., there is a good deal of overlap among the variables. In order to provide clinicians and other users with more readily usable information, the present investigation has determined, factor analytically, what independent factors are evaluated by means of the Figure-Drawing Test, and which are most important.

Based upon 788 sets of figure drawings, 10 independent factors were identified which accounted for approximately 55% of the variance associated with all 57 variables. Another 1% of the variance could have been accounted for by including an additional 6 factors, but the small benefit gained by their inclusion would

TABLE 3

FIGURE-DRAWING FACTORS

Category of Factors

I. Actual Figure Characteristics

1. Sophistication
2. Male-figure Perspective
3. Nudity
4. Arms Position
5. Completeness
6. Female-figure Perspective

II. Graphic Characteristics of Figures

1. Firmness/Boundary
2. Constancy

III. Positioning of Figures on Page

1. Orientation
2. Location

be more than outweighed by the cost of having to consider 16 rather than 10 factors. The 10 factors which were identified appear to fall into 1 of the 3 categories shown in Table 3.

Inspection of Table 3 reveals that 6 of the factors are related to descriptive characteristics of the figures themselves such as sophistication and nudity. Two factors are related to the graphic characteristics of the figures, i.e., to the techniques employed by the idividuals in drawing the figures, while 2 other factors are related to how the figures are positioned on the page.

Although the figure drawings were scored in terms of 57 variables, it can be seen from Table 1 that only 3 variables concerned both the male and female figures combined. The other 54 variables were actually 27-variables which were scored separately for the male and female figures. It is interesting, then, that of the 10 factors identified, only 2 pertain to the two sexes separately. This suggests that the manner in which the individual draws a figure of one sex is very similar to the manner in which he draws the opposite sex. Thus, having the individual draw 2 figures may provide the clinician with little more information than would a single figure. The fact that male-figure perspective and female-figure perspective emerged as 2 independent factors, however, indicates that the position and perspective from which the individual draws the figure of one sex is independent of that for the figure of the other sex.

The figure-drawing factors identified in this study will be of immediate value to the Precursors Study (Thomas, 1966). Specifically, we shall next determine whether these factors are related to the occurrence of various disease states. They should also be useful to the clinician who, by knowing what independent factors the Figure-Drawing Test assesses, will be able to evaluate his data more meaningfully.

APPENDIX

Code for Scoring 57 Figure-Drawing Variables

B = Both figures M - Male figure F = Female figure

	0	1	2	3	4	5
1. B-Stick figure	No	Yes (one or both figures)				
2. B-Sex sequence	M first	Indeterminate	F first			
3. M-Posture	Upright	Other	Not upright			
4. M-Activity	Stationary	Uncertain	Active			
5. F-Posture	Same as Variable 3.					
6. F Activity	Same as Variable 4.					
7. M-Head-body concordance	Concordant	Other	Discordant			
8. M-Position	Full front view	Oblique front view	Side view or other	Oblique back view	Full back view	
9. F-Head-body concordance	Same as Variable 7.					
10. F. Position	Same as Variable 8.					
11. M-Vertical midline	Lacking	Uncertain	Apparent			
12. F						
13. M-Bilateral symmetry	Lacking	Little		Slight		Apparent
14. F						
15. M-Horizontal midline	Lacking	Doubtful	Present			
16. F						
17. M-Omitted appendages	None or indeterminate	Minor (feet, hands)	Major (arms, legs			
18. F						
19. M-Visibility of arms	Not visible or indeterminate	Partially visible	Both visible			
20. F						
21. M-Position of right arm	Nonextended or indeterminate	Partially extended	Fully extended			
22. F						
23. M-Position of left arm	Same as Variables 21-22.					
24. F						

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	0	1	2	3	4	5
25. M-Position of Legs	Not visible or Indeterminate	Closed		Slightly Apart		Widely Apart
26. F						
27. M-Relation of figure axis to page axis	Parallel to long axis of page	Intermediate or other	Parallel to short axis			
28. F						
29. M-Left/right location on page	Left half	Predominantly left	Centered or uncertain	Predominantly right	Right half	
30. F						
31. M-Top/bottom location	Top half	Predominantly top	Centered or uncertain	Predominantly bottom	Bottom half	
32. F						
33. M-Quadrant location	Within two or more quadrants	All in one quadrant or other				
34. F						
35. B-Relative size of figures	Man larger	Man slightly larger	Equal or other	Woman slightly larger	Woman larger	
36. M-Constancy of line pressure	Variable or uncertain	Constant				
37. M-Degree of line pressure	Light or vague		Medium			
38. F-Constancy of line pressure	Same as Variable 36.					
39. F-Degree of line	Same as Variable 37.					
40. M-Continuity of boundary	Discontinuous or uncertain		Intermediate		Continuous	
41. F						
42. M-Body shading	None or uncertain	Present				
43. F						
44. M-Hair shading	No hair or Indeterminate	Hair not shaded	Hair shaded			
45. F						
46. M-Nudity	Completely nude	Partially clad	Completely clad			
47. F						
48. M-Transparency of figure	No transparency	Transparency				
49. F						
50. M-Form level	Primitive or uncertain		Intermediate		Sophisticated	
51. F						

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	0	1	2	3	4	5
52. M-Level of detailing	Same as 50-51.					
53. F						
54. M-identity and sex differentiation	Same as 50-51.					
55. F						
56. M-Overall sophistication	Indeterminate	Primitive		Intermediate		Sophisticated
57. F						

Some code numbers are undefined, as in Variables 13-14, 25-26, 37, 39, 40-41, and 50-51. They were used when two judges disagreed in order to reconcile their coding.

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