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FACTORS IN THE DETERMINATION OF PREFERENCE JUDGMENTS FOR POLYGONAL FIGURES: A COMPARATIVE STUDY [1]

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On demande à de larges échantillons égyptiens d'étudiants en Arts et d'étudiants d'autres disciplines de juger une série de polygones d'après leurs préférences esthétiques et à l'aide d'une échelle en 7 points. Les jugements sont soumis à une intercorrelation séparée pour 3 groupes (étudiants en Arts du sexe masculin, étudiants en Arts du sexe féminin et étudiants d'autres disciplines du sexe féminin) et on procède à une analyse factorielle des matrices obtenues. Quinze facteurs sont extraits et soumis à une rotation Varimax. Les facteurs retenus sont comparés à des facteurs similaires obtenus précédemment chez des sujets anglais. Il est possible d'interpréter une douzaine de facteurs pour l'échantillon égyptien et ceux-ci s'avèrent très semblables aux facteurs observés chez les Anglais. Les A. concluent que les résultats ne sont pas en faveur d'une interprétation purement culturelle des déterminants des jugements esthétiques préférentiels.

Two previous studies have reported preference judgments for polygonal figures of English and Japanese (Eysenck and Iwawaki, 1971) and English and Egyptian (Soueif and Eysenck, 1971) subjects. Both studies found considerable agreement in mean ratings for the cross-cultural samples. This study is concerned not with mean ratings, but rather with what might be called the fine grain of judgment, *i.e.* the various factors which determine preference judgments. Detailed factor analyses of preference ratings for the 90 Birkhoff (1932) polygons have been reported for English samples, both of artists and non-artists, by Eysenck (1968) and Eysenck and Castle (1970) and it was shown that there are about a dozen replicable factors which determine these preference judgments; these factors were largely independent of sex or amount of art training. The present investigation is concerned with a similar analysis of ratings made by Egyptian students, and a comparison of the resulting factors with those which had emerged from the English samples; it seemed reasonable to predict, in view of the similarity in mean rating observed earlier, that the factors emerging from this analysis would

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also be similar. However, in the absence of any previous studies of this kind, no firm prediction could of course be made.

METHOD

Our sample consisted of 494 male students of Art Institutes of Cairo and Alexandria and 298 female students at such Institutes; these two groups constitute our sample of "artists". The term is used to signify the fact that all these students had had some official training in the visual arts; it does not mean that all of them were fully developed artists. In addition we had a control group of 145 female non-art students; these girls studied a variety of subjects not comprising visual arts. All the subjects were presented with the 90 Birkhoff polygons, printed black on white on sheets of paper, with instructions to rate them on a 7 point scale. No difficulties were encountered in complying with these instructions; very much like the English subjects, Egyptian subjects considered the request reasonable and relatively easy to carry out.

Product-moment correlations were calculated between the 90 items, with age added as a 91st item; the three resulting matrices were then factor analyzed by means of principal components, 15 factors being extracted. This number was decided on after consideration of the previous factor analyses of English samples, which suggested a dozen or so viable factors. Factors were then rotated by Promax. The results reinforced our belief that a dozen or so factors exhaust the meaningful and replicable covariance.

RESULTS

The major factors emerging from the analyses of our male and female samples are very similar to each other, and also to the factors extracted from our European samples. We will state the tentative name given to each factor, the items loading above .3 on that factor for both samples, and discuss the appropriate factor from previous work to which the present factors appear to have some resemblance.

TABLE 1

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
42	.73	59	.72	26	.66
44	.73	55	.71	62	.66
55	.67	62	.70	23	.65
62	.64	42	.65	42	.65
26	.62	44	.59	55	.62
86	.58	56	.59	44	.58
36	.53	54	.55	36	.45
39	.46	85	.50	59	.44
23	.45	26	.46	43	.43
45	.44	83	.42	39	.42
83	.44	23	.42	64	.41
56	.42	39	.42		
59	.40	57	.42		
		58	.42		

(Where large number of items had loadings above .4, loadings below that value have been limited in the tables.) The order in which the factors are discussed is

of course arbitrary; it seemed useful to follow the order of factors given in Eysenck and Castle (1970), to facilitate comparison. The first factor, then, is one rectangularity; the items and loadings are shown in Table 1. The similarity to the European factor of the same name is very clear.

Factor 2 is called simplicity; here too the similarity to the European factor of that name is obvious. Loadings are given below in Table 2.

TABLE 2

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
2	.60	3	.66	1	.82
3	.58	1	.57	2	.73
19	.55	19	.55	3	.64
1	.45	11	.54	19	.46
11	.45	2	.51	4	.39
70	.37	70	.49	8	.38
		4	.41	70	.37
		17	.30	11	.36
		37	.30		

Factor 3 in the European sample is labelled " rotational symmetry ", and the Egyptian factors bear some relation to this. However, the European factor " cross " (*i.e.* cross-shaped polygons) overlaps with the " rotational symmetry " one in the Egyptian sample. The explanation may lie in the representational-symbolic character of the cross motif in Christianity; this may have singled out

TABLE 3

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
51	.73	51	.68	69	.69
50	.68	69	.68	41	.66
53	.65	53	.63	65	.62
69	.61	41	.62	89	.61
25	.49	89	.61	53	.57
24	.48	65	.48	51	.55
41	.47	68	.48	66	.51
68	.46	67	.45	67	.50
13	.45	88	.44	68	.45
52	.41	25	.43	45	.42
89	.40	87	.42	74	.42
29	.40	50	.40		

a number of shapes only vaguely cross-like and caused them to form a separate factor. It is interesting that Eysenck (1968) found a " pure " cross factor and

additionally a " cross motif " factor in an English sample; these two factors were not highly correlated. Most of the " cross motif " items possess rotational symmetry, and in a sample which does not have the Christian background of symbolism one need not be surprised to find the two factors coalescing. This explanation is of course speculative, but it does seem to account satisfactorily for the observations. Note that there is also a " pure cross " factor in the Egyptian sample just as there was in the Eysenck (1969) sample of English subjects. Table 3 gives the loadings for Factor 3.

Table 4 contains items and loadings for the " simple cross " factor mentioned above.

TABLE 4

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
9	.75	49	.83	9	.82
49	.75	9	.82	13	.81
13	.48	13	.61	49	.78
		29	.42	39	.74
		50	.32	25	.56
				24	.51
				50	.51

Associated with the " cross " factor, sometimes coincidental with it and sometimes not, is a " star " factor; Table 5 contains items and loadings for this factor which comes out independent of the " cross " factor.

TABLE 5

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
8	.63	40	.72	6	.66
40	.63	8	.63	40	.66
6	.54	6	.62	8	.60
24	.46	24	.49	24	.46
67	.41	39	.33	48	.39
39	.37	57	.32	31	.34
25	.31			52	.34

Our next factor is called " projections "; figures contain elongated projections or protuberances, somewhat like a steeple. Items are shown, together with loadings, in Table 6. This factor is more clearly marked in our male sample; Freudians might speculate about the symbolic significance of " projections ".

Factor 7 is called " elliptical "; it appeared in both the European analyses. In the first (Eysenck, 1969) it was separate from another factor, " circular ", while in the second (Eysenck and Castle, 1970) both appeared in the same factor.

TABLE 6

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
27	.66	27	.66	90	.69
46	.66	31	.56	46	.64
90	.65	90	.43	31	.54
31	.47	46	.41	27	.53
71	.46	30	.36	75	.42
73	.44	11	.34	70	.41
75	.41			71	.41
89	.35			56	.40
28	.34			74	.40
56	.31			77	.38
				17	.34
				18	.30

In the present analysis these two factors are separated, the " circular " factor is reproduced below as Factor 8. Table 7 gives loadings for factor 7, Table 8 for factor 8.

TABLE 7

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
32	.76	32	.70	32	.72
63	.69	60	.70	63	.70
33	.68	63	.69	47	.68
60	.64	33	.68	60	.64
21	.62	47	.61	21	.60
20	.56	20	.58	35	.54
47	.54	61	.48	33	.53
30	.49			30	.49
48	.47			20	.46
				16	.43
				17	.40

Factor 9 is called " distortion "; it is somewhat difficult to conceptualise, and was not easy to cross-identify from artist to control sample. Eysenck and Castle (1970) described it as consisting of " pinched-in, or distorted, or oblique transformations of simple, ordinary shapes, like rectangles. In some cases, embellishments seem to have been added ". The loadings are given in Table 9.

TABLE 8

Male Artists		Female Artists		Female Non Artists	
Item	Loading	Item	Loading	Item	Loading
12	.66	12	.74	10	.74
5	.60	10	.70	12	.64
10	.60	16	.63	5	.55
16	.55	5	.59	16	.46
4	.43	30	.39	11	.43
7	.37	22	.36	15	.40
		7	.30	7	.38
				4	.37
				48	.36
				18	.34
				59	.33
				61	.33
				68	.30

TABLE 9

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
87	.62	73	.71	82	.69
84	.61	72	.70	87	.68
81	.59	71	.69	84	.63
82	.56	76	.60	86	.62
80	.56	81	.58	81	.60
88	.53	86	.56	85	.59
78	.50	90	.56	83	.58
83	.49	84	.51	77	.58
89	.48	77	.51	76	.56
86	.48	74	.48	88	.55
77	.48	82	.44	78	.52
79	.46	75	.42	79	.51
76	.45			80	.49
75	.41			74	.47
				66	.42
				75	.42
				89	.42
				73	.41
				71	.40

Factor 10 lists variants of a triangle; it is very similar to the factor of that name in Eysenck and Castle (1970). Loadings are given in Table 10.

TABLE 10

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
14	.68	14	.71	14	.62
15	.56	15	.61	71	.44
7	.54	7	.54	13	.43
30	.44	35	.54	15	.38
39	.44	79	.49	72	.36
		17	.40		
		28	.40		
		58	.36		
		36	.32		
		30	.31		

This concludes our list of main replicated factors, but there is an additional factor (Factor 11) which resembles Factor 4B of the Eysenck (1969) study, which was then declared to be impossible to interpret. Table 11 lists the items and loadings.

TABLE 11

Male Artists		Female Artists		Female Non-Artists	
Item	Loading	Item	Loading	Item	Loading
57	.68	57	.40	57	.67
58	.67	58	.38	52	.59
61	.52	5	.32	58	.58
56	.45	83	.30	56	.46
54	.39			59	.39
59	.38			43	.38
52	.37			54	.36
71	.35			53	.32
60	.33				
64	.32				
72	.31				

This factor may be nothing but a doublet; 57 and 58 are two very similar figures indeed, and the rest of the factor may be nothing but statistical artefact. There is a curious disproportion between male and female loadings, the former being obviously in the majority.

A 12th factor is also clearly a doublet, similar to factor I in the Eysenck and Castle paper, although that factor had more items in it and was given a different interpretation. The two main items for our male sample are 38 (loading .56)

and 64 (loading .52); these are two " pillars " closely resembling each other. Item 43 also has a loading, but it is much lower (.40). There is no factor corresponding to this in the matrix for females.

Age was included as one of the 91 variables to be intercorrelated, and in each of the three factor analyses one factor emerged which had a very high loading on age, with no other item having a loading above .30. The loadings on age for the male art, female art, and female non-art groups were .756, .517, and .572, suggesting that changes in age produced certain changes in the preference judgments for certain polygons. If this were true, then it seemed that the set of 90 loadings making up the " age " factor (*i.e.* loadings for the 90 polygons, but excluding the loading on age itself) should be correlated from one group to the other, *i.e.* certain polygons would be preferred by the younger members in each group, others by the older members. This proved to be so; the correlations between the sets of factor loadings were .33, .13 and .38 respectively, the first and last being statistically significant at p levels $< .01$ and $< .001$. These correlations are not large, but it is surprising that age should play any part in the determination of preference judgments at all, considering that the variation in age in these groups is very small; mean age for the whole sample was 22 years, with a *S.D.* of only 2 years. If seems likely that in groups having greater variances more marked effects would be found; here we can only note the suggestion that age may be an important variable, even after adolescence has been passed. Work with children has shown that, as one might have expected, age is an important variable in determining their preference judgments (Eysenck, 1972); in adults there is no previous evidence at all on the importance of age in this connection.

DISCUSSION

The data summarized in the preceding section indicate quite clearly that on the whole the factors determining aesthetic preference judgments in Egyptian students, both art and non-art trained, and both male and female, are essentially very similar to those determining aesthetic preference judgments in English students. In all groups there are about a dozen factors identifiable in terms of the polygons having the highest saturations; the names given to these factors are of course in part subjective, but do seem to express the nature of the factors quite well. In each case there is a particular feature which stands out, and enables reasonably unambiguous naming of the factor. The main features are rectangularity, simplicity, rotational symmetry, approximation of the polygon in shape to a cross, a star, an ellipse, a triangle, or a circle, and having projections or distortions. There are some small differences between the national samples; we have noted that the " cross " factor, except in its simplest form, is taken over into the " rotational symmetry " factor as far as the Egyptian sample is concerned. The difference is not great, and it may find an explanation, as suggested in the last section, in the fact that the cross is a religious motif which has more meaning for a Christian than for a Mohammedan population. Our data support our previous conclusion that there appear to exist firm cross-cultural tendencies which predispose people to prefer certain polygonal forms to others; these predispositions not only govern overall preference judgments, but extend to the finer detail into

which the overall judgments can be split. Such a conclusion would seem to contradict a purely environmental, cultural interpretation of aesthetic judgments, and suggest the possibility of a more deeply based, biologically determined cause for aesthetic judgments.

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