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A CROSS CULTURAL CHECK OF THE PERSONALITY STRUCTURE OF THE 16PF

Itai Zak
Tel Aviv University, Israel

ABSTRACT

The contention that transferability of a scale across cultures is best achieved when the scale has low homogeneity was tested using Cattell's 16PF personality questionnaire. The 16PF was administered to a random sample of 514 university applicants in Israel. The data yielded essentially the same psychometric properties as found in the original American samples. The problem of homogeneity is further discussed in relation to validity coefficients.

INTRODUCTION

The use of low homogeneity items in determining a unifactorial personality trait has been a subject of long-standing controversy (see Levonian, 1961; Eysenck and Eysenck, 1969; Howarth and Browne, 1971; Cattell, 1973; Burdsal and Vaughn, 1974; Guilford, 1975). Nunnally, in his recent address to the Annual Meeting of AERA, 1975, argued for tests homogeneous in content and with high item-total correlations. He recognized, however, that "the same patterns of results usually can be observed . . . in factor analyses even if the tests have only modest reliability (1975, p. 10)," where reliability, in his terms, is best defined by the square root of the mean inter-item correlation, *i.e.*, homogeneity. Cattell (1973), on the other hand, has advocated low homogeneity as a desired characteristic of a proper personality scale, recognizing that with a given number of items in a scale, low homogeneous items will load only moderately on their respective scales. Cattell's main point is "that because a test of lower homogeneity tends to sample behavior more widely, it is more likely to maintain its validity across different subcultures and cultures, that is, to reach a high transferability coefficient (1973, p. 357)."

The intention of this study was to examine the scale properties of the 16PF in its Hebrew translation, and in an Israeli subculture of university students, with regard to the notion of transferability. One would expect, if Cattell's argument is valid, that similar scale properties (homogeneity, item validity and scale validity) would be found in the Israeli sample.

METHOD

The Hebrew translation of the 1967 edition of the 16PF was administered to a random sample of the 1975 group of university applicants at Tel Aviv University. The sample consisted of 514 individuals, approximately half of whom were males. It should be mentioned that the Hebrew version of the questionnaire contains only 15 scales. Factor B (intelligence) appears in a separate form and was not administered to the above particular sample. Thus the results pertain to the 15 basic factors only.

ANALYSIS

The analysis of the data was performed in three stages. First, mean item-intercorrelations (homogeneities), and alpha coefficients were calculated for the items keyed to each scale. Then, each scale was subjected to two types of factor

Table 1

Factor Loadings of Salient Items on Their Associated Factors

A	C	E	F	G	H	I	L	M	N	O	Q_1	Q_2	Q_3	Q_4
08	44	17	19	21	50	64	15	08	37	44	33	08	45	36
10	21	26	40	57	61	12	21	03	05	26	20	20	28	56
34	19	-02	48	31	30	40	17	50	31	53	-15	27	17	38
28	43	22	46	38	34	30	04	39	24	42	20	15	22	27
23	34	33	48	15	66	54	55	18	16	37	27	37	04	50
11	42	11	43	61	63	60	-14	21	54	24	24	34	56	64
41	37	19	16	13	41	39	25	20	26	45	01	36	59	39
24	11	54	34	28	64	52	36	36	-17	35	18	38	04	52
36	36	10	36	62	50	20	11	23	12	34	00	50	11	30
28	42	11	12	59	54	42	18	30	-07	-00	56	43	14	47
	39	54	54		15			32		16				23
	39	52	37		40			15		11				66
	31	44	25		44			06		38				44
mean item validity	.244	.337 / .271	.354	.383	.471	.414	.189	.231	.180	.315	.215	.308	.260	.422

Note: Decimal points are omitted from factor loadings; two places should be assumed.

analyses: (1) principal components and (2) principal factor with iterations, where squared multiple correlations served as initial estimates of communalities.

The principal component solution was used in order to calculate Θ (theta) coefficients (Armor, 1973, p. 28; Mulaik, 1972, p. 211; Kaiser & Caffrey, 1965). These coefficients can be regarded as generalizability coefficients (in Cronbach's terms; see Cronbach et al. 1972), and would be equivalent to alpha coefficients computed with weighted items. Since it is not used much in the literature, the formula for theta coefficients is as follows:

$$\Theta = [k/(k-1)][1-(1/\lambda_1)]$$

where k is the number of factors which equals the number of items, and λ_1 is the first eigenvalue in the principal component solution. In the principal factor analysis, the number of factors for each scale was determined to equal the number of items in the scale (10 or 13), according to the keyed items). This procedure allows for the variance of an item on unwanted factor to appear. Thus, the communality of an item j (h^2_j) is composed of the variance of an item on the first-wanted factor (the general factor, before rotation), and its variance on the other k-1 (when k = number of factors which is equal to n number of items) unwanted factors.

Item validity was defined as the correlation of the item with the first-wanted factor. The validity of the given scale *s* against the wanted factor *w* was computed using Cattell's formula (1973, p. 373, formula 9.11).

RESULTS

Table 1 contains the loadings for each of the items on the scale upon which it is scored, and the mean item validity for each scale. The mean intercorrelations, (homogeneities), scale validity coefficients (r_{sw}), and theta coefficients may be found in Table 2.

DISCUSSION

The mean intercorrelation of items keyed for factor, and the validity coefficients are very similar to Cattell's findings (Cattell, 1973, p. 309, Table 44).

Table 2

Psychometric Properties of 16 PF Scales.

Israeli students (N=514)

Scale	Mean inter-correlation of items	Scale validity r_{sw}	Coefficient theta	Burdsal's R^2	sample[a] Alpha
A	039	659	323	489	591
C	092	842	600	802	582
E	068	734	543	735	529
F	113	837	638	704	664
G	137	817	641	692	560
H	225	903	788	885	849
I	158	845	678	850	672
L	023	540	303	671	473
M	041	673	422	607	417
N	015	529	329	395	081
O	078	819	586	452	536
Q_1	028	614	298	534	327
Q_2	083	733	484	669	473
Q_3	058	667	450	636	350
Q_4	183	891	754	745	711

Note: Decimal points are omitted; three places should be assumed.

[a]Reproduced by permission of the Journal Press, from Burdsal and Vaughn, (The Journal of Genetic Psychology, 1974, 125, 219-224 Table 2)

High scale validities in our study match his highs, and lower validities (lower than .65, such as in factors L, N, Q_1) in this study correspond to Cattell's low-validity scales. Yet, it is recognized that validities well-established for use in one population may disappear for certain individual items (as can be seen in Table 1), when using population differing socially or in age. For that reason, a comparison to Burdsal and Vaughn's study (1974), which was conducted on an American student sample, might be more appropriate.

Burdsal and Vaughn found that four of the 16 factors are in need of revision. Their conclusion was based on item-factoring of the 16PF scales which indicated that on those four scales a significant number of items which should have loaded the scale, in fact did not. Those factors were G, M, N, Q_1. Two of these factors, namely G and Q_1 might have been affected, according to their explanation, by the peculiar subculture, namely, the college student sample. As can be seen in Table 1, the findings of the present study revealed that factors N and Q_1 show a poor fit to the expected factor pattern in the Israeli student sample as well, while factor L instead of G and M is added to the scheme (see Table 2 for comparison of our results to Burdsal's).

Thus, the scales with the lowest validity coefficients require an explanation beyond the one suggested by Burdsal & Vaughn, or the classical explanation of low homogeneities per se. The upper limit of validity coefficient, when the number of items in a scale approaches infinity, is determined by the ratio of the mean item validity to the square root of item homogeneity (for detailed discussion and a proof, see Mulaik, 1972, p. 63-67). Accordingly, even with a given number of items in a scale, such as in the 16PF, the closer the ratio is to 1.00, the higher is the scale validity coefficient.

Computations of these ratios in our data revealed that while in most of the scales they hover around 1.00 (from 0.99 in factor H to 1.27 in factor O), thus, reaching the maximum possible validity coefficient with a given number of items, the ratios for factors N, Q_1, L and A are much higher; they are 2.16, 1.65, 1.55 and 1.53 respectively.

Generally, however, the results indicated that the 16PF factor structure is transferable across cultures and languages. The similarity of results in two different countries and languages, and the similar results found in the same subculture (students) across countries render support for Cattell's contention of the possible connection between low homogeneity and high transferability. If one accepts this contention, it may be concluded that factor analytic test construction can proceed most profitably with the notion of the item validity to item homogeneity ratio as a guide for item selection, rather than with the classical approach.

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