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NOTES AND SHORTER COMMUNICATIONS

Predicting EPQR full scale scores from the short form version

P. T. BARRETT and S. B. G. EYSENCK

Institute of Psychiatry, Biosignal Laboratory, Bethlem Royal Hospital, Monks Orchard Road, Beckenham, Kent, England

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Summary—Linear regression equations are presented below that estimate each EPQR full scale score from the short form scale score. These equations were computed over 747 female and 517 male subjects, drawn from the U.K. reference sample of the EPQR questionnaire. Goodness of fit estimates range from a low of 74% to a maximum of 90%. Examination of alternative nonlinear regression models yielded inferior goodness of fit statistics. Finally, 3 tables are provided (male, female, and total sample) that allow simple lookup of the estimated full scale score from its short form counterpart.

INTRODUCTION

The EPQR (Eysenck, Eysenck & Barrett, 1985) contains 100 items in the full scale version, 32 items in the Psychoticism (P) scale, 23 in Extraversion (E), 24 in Neuroticism (N), and 21 in Social Desirability. The short form version of the test contains 12 items per scale. Since the original publication of both forms of the test, a need has arisen for the estimation of full scale scores from the short form version. Generally, this need has occurred where data collection within a project has generated both long and short scale scores, either because some individuals could only be assessed on the short form (due to time pressure) or where a mistake has been made and the short form used inadvertently. In order to be able to use the short form data, it is apparent that some form of extrapolation is required that will map each short scale score onto its full-scale equivalent. The methodology below is an attempt to provide an optimal strategy for achieving this extrapolation.

METHOD

Data from 747 female and 517 males *S*s, who had completed the full EPQR, were used in the estimation procedures. The age range of the female *S*s was between 16 and 70 yrs with a mean of 32.25 and standard deviation of 14.50 yrs. For the male *S*s the range was also between 16 and 70 yrs with a mean of 36.65 and standard deviation of 16.84 yrs. These data were drawn from the Eysenck *et al.* (1985) dataset Sample B and from a further 362 *S*s who had taken part in another experiment in the laboratory. This latter sample was formed from volunteers attending an experiment assessing the relationships between Ability and Personality test scores (project IQ). The age range of this sample was limited between 17 and 50. The means and standard deviations for the combined sample used in the analyses below are reported in Table 1.

Each *S*s 100 item dataset was scored twice, the first scoring generated the long form EPQR scores, the second scoring generated scores from the 48 item subset that form the EPQR-short scale version. Examination of scatterplots comparing short and long form scale scores showed that a linear function would probably estimate the long scale scores from their short form equivalents. However, in order to ascertain whether the linear, single slope parameter model was best, quadratic and cubic polynomial models were also fitted. There was little or no increase in fit using these more complex models. Secondly, a general logistic model regression (Neter, Wasserman & Kutner, 1985) was fitted to each scale, constraining the minimum estimated scale score to 0 and the maximum equal to the number of items in each scale. Using the nonlinear estimation module of CSS-STATISTICA (1991), with a least squares loss function, goodness of fit was slightly inferior in most cases to that of the simple linear regression approach. In addition, for the N scale, optimization had to be via the Rosenbrock Pattern search method as the Quasi-Newton and Simplex procedures incurred penalty loss functions due to estimated values of 0.0 (the log of 0.0 being undefined). So, given that none of the complex models fitted was superior to that of the simple linear model (using the least squares loss function), it was decided to fit the linear functions to the data, by sex, and for the total dataset. Table 2 provides the 12 equations, their goodness of fit coefficients, and the Pearson correlation between the observed long and short scale scores.

As can be seen from Table 2, the P scale fit is the least optimal of all scales. In addition, it can be seen that there is very little difference between the male and female functions. As a by-product of this analysis, the samples were further split into two age groups, 29 and below, and 30+. The regressions were implemented separately on these age group data. Results from this sub-analysis indicated trivial differences between the two functions fitted, and the overall function. Thus, using the sample as defined above, it was concluded that the age-indifferent functions reported in Table 2 were optimal. For purposes of convenience, Table 3 provides the lookup tables for short scale to estimated integer long scale scores. The rounding error associated with converting the estimated fractional values to the nearest integers has no significant effect (mainly in the 3rd or 4th decimal place) when computing correlations between these and other criterion variables. As will be seen from Table 3, the estimated P scale scores do not encompass the entire measurement range of the full P scale (a maximum of 32). This "compression" effect is due to the fact that in both the male and female samples, the maximum score observed (for 1 *S* only) was 26, with a second *S* scoring 24 in the females and only 2 *S*s scoring 22 in the males. Thus, there was insufficient information at this end of the scale to permit any extrapolative estimation.

Table 1. Means and SD of the analysis sample

	Males $N = 517$		Females $N = 747$	
	Mean	SD	Mean	SD
Short P	3.33	2.17	2.56	2.01
Long P	7.67	4.46	6.11	3.94
Short E	6.63	3.80	7.74	3.26
Long E	12.96	6.14	14.44	5.04
Short N	5.02	3.43	6.01	3.20
Long N	10.75	5.83	12.72	5.30
Short L	3.69	2.66	3.70	2.53
Long L	6.78	4.21	6.98	3.93

Table 2. Linear prediction equations

Regression equations	% Fit	Short vs long scale correlation
Females (N = 747)		
long_P = 1.73695 + short_P*1.71088	75.95	0.87
long_E = 3.20567 + short_E*1.45019	87.68	0.94
long_N = 3.29887 + short_N*1.56682	89.28	0.94
long_L = 1.60226 + short_L*1.45228	87.41	0.93
Males (N = 517)		
long_P = 1.77534 + short_P*1.76865	73.88	0.86
long_E = 2.79478 + short_E*1.53241	90.17	0.95
long_N = 2.65609 + short_N*1.61341	90.01	0.95
long_L = 1.26989 + short_L*1.49499	89.34	0.95
Total (N = 1264)		
long_P = 1.73181 + short_P*1.74553	75.72	0.87
long_E = 2.99779 + short_E*1.48625	89.04	0.94
long_N = 2.96846 + short_N*1.59592	89.79	0.95
long_L = 1.46199 + short_L*1.47089	88.21	0.94

With regard to using the separate sex functions or the total sample functions, there is little to choose between them. However, for maximum numerical accuracy or where a researcher only has a single sex sample, then the sex-specific functions should be used. Otherwise, for large sample scoring and statistical analysis, the total group functions would be acceptable. As can be seen from Table 2, the correlations between short and long scales only differ in the 2nd decimal place.

In order to examine the stability of product moment correlations between the long and short EPQR scale scores and external criteria, I_7 questionnaire (Eysenck, Pearson, Easting & Allsopp, 1985) scale scores from the 362 *S*s in project IQ, were correlated with the EPQR scores. Table 4 provides the matrix for both male and female *S*s. The EPQR scale intercorrelations were computed over the full datasets (517 males and 747 females), respectively. The correlations between the I_7 scales of Impulsivity, Venturesomeness, and Empathy, and the EPQR scales were based on 109 male and 253 female

Table 3. Short scale and predicted long scale scores

P		E		N		L	
Short	Long	Short	Long	Short	Long	Short	Long
			Females				
0	2	0	3	0	3	0	2
1	3	1	5	1	5	1	3
2	5	2	6	2	6	2	5
3	7	3	8	3	8	3	6
4	9	4	9	4	10	4	7
5	10	5	10	5	11	5	9
6	12	6	12	6	13	6	10
7	14	7	13	7	14	7	12
8	15	8	15	8	16	8	13
9	17	9	16	9	17	9	15
10	19	10	18	10	19	10	16
11	21	11	19	11	21	11	18
12	22	12	21	12	22	12	19
			Males				
0	2	0	3	0	3	0	1
1	4	1	4	1	4	1	3
2	5	2	6	2	6	2	4
3	7	3	7	3	7	3	6
4	9	4	9	4	9	4	7
5	11	5	10	5	11	5	9
6	12	6	12	6	12	6	10
7	14	7	14	7	14	7	12
8	16	8	15	8	16	8	13
9	18	9	17	9	17	9	15
10	19	10	18	10	19	10	16
11	21	11	20	11	20	11	18
12	23	12	21	12	22	12	19
			Total				
0	2	0	3	0	3	0	1
1	3	1	4	1	5	1	3
2	5	2	6	2	6	2	4
3	7	3	7	3	8	3	6
4	9	4	9	4	9	4	7
5	10	5	10	5	11	5	9
6	12	6	12	6	13	6	10
7	14	7	13	7	14	7	12
8	16	8	15	8	16	8	13
9	17	9	16	9	17	9	15
10	19	10	18	10	19	10	16
11	21	11	19	11	21	11	18
12	23	12	21	12	22	12	19

Table 4. Correlations between short and long scale scores and three other personality scale scores

	Impulse	Venture	Empathy	Short P	Long P	Short E	Long E	Short N	Long N	Short L	Long L
Impulse		0.25	−0.02	0.33	0.49	0.35	0.45	0.24	0.29	−0.29	−0.32
Venture	0.24		−0.17	0.18	0.15	0.33	0.37	−0.10	−0.06	−0.27	−0.29
Empathy	0.07	−0.14		−0.16	−0.12	−0.05	−0.09	0.32	0.34	0.11	0.04
Short P	0.33	0.28	−0.09		0.86	0.10	0.14	0.07	0.07	−0.24	−0.27
Long P	0.41	0.30	−0.11	0.87		0.15	0.21	0.18	0.21	−0.29	−0.32
Short E	0.35	0.39	−0.11	0.06	0.10		0.95	−0.10	−0.04	−0.20	−0.23
Long E	0.43	0.40	−0.11	0.10	0.14	0.94		−0.07	0.01	−0.26	−0.30
Short N	0.15	−0.17	0.39	−0.02	0.05	−0.15	−0.17		0.95	−0.16	−0.17
Long N	0.20	−0.16	0.42	−0.04	0.06	−0.11	−0.12	0.94		−0.23	−0.24
Short L	−0.24	−0.07	0.02	−0.10	−0.13	−0.11	−0.15	−0.17	−0.21		0.95
Long L	−0.31	−0.08	0.03	−0.13	−0.16	−0.14	−0.18	−0.19	−0.23	0.93	

The upper triangular matrix is from male data, the lower from female data.

*S*s. As can be seen from this table, the pattern of correlations between the long and short EPQR scales and the three I_7 scales is indicative of some slight attenuation in the short scale correlations. This attenuation is mainly observed in the Psychoticism and Extraversion short scales.

Finally, two words of caution. The use of the regression functions to estimate long scale from short scale scores may be efficient within a statistical analysis framework. That is, relationships between scale parameters may remain reasonably stable, regardless of which length scale is used. However, using the long scale estimates as an interpretative aid for individual subject scale scores is not recommended. The distribution of observed long scale scores on each short scale score is too wide. For example, a short scale score of 2 on P yields a long scale score range between 2 and 13, although over 75% of the scores lie between 3 and 7. For E, a short scale score of 4 yields an observed long scale score range between 5 and 14, although over 75% of the scores lie between 7 and 11. Secondly, if examining a clinical sample where the P scores might be expected to be exceptionally high, it would be wise to use the long form of the scale due to the estimated P score compression effects noted above.

A 52 page detailed analysis document may be requested from the authors. This document provides other background statistics, the frequency tables of observed long and short scale scores, and the scatterplot graphs for observed long and short scale scores.

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