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The measurement of extraversion: A comparison of the Eysenck Personality Inventory and the Eysenck Personality Questionnaire

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The authors of the Eysenck Personality Inventory (EPI) and the Eysenck Personality Questionnaire (EPQ) have claimed that the extraversion scales contained in the two tests are equivalent. Although scores on the two scales are moderately highly correlated, supplementary analyses suggest that they differ in at least one important respect. While the EPI scale measures extraversion as a reasonable mix of impulsivity and sociability, the EPQ's scale is almost purely a measure of sociability. Recent experimental evidence demonstrates that impulsivity is responsible for several findings previously attributed to extraversion. This evidence raises serious doubt about the usefulness of the EPQ extraversion scale in experimental research on extraversion.

After a measurement device has been in use for some time, the original investigator will often want to revise it on the basis of growth in the theory that spawned the scale. Alternatively, psychometric analysis may suggest that the reliability and/or validity of the scale would be enhanced by the deletion of existing items or the addition of new items. In either of these cases, if the revised scale can be shown to be simply an alternate form of the original, we feel justified in applying the validational data accumulated with the original scale to the revision. Three criteria should be met in order to demonstrate that the two scales are in fact equivalent:

(1) Scores on the two scales should correlate highly. This is the traditional and minimal requirement.

(2) The two scales should have the same pattern of relationships to theoretically important constructs. One way in which this is demonstrated is by the pattern of correlations between the two putatively parallel scales and other personality scales. Ideally, the new scale should demonstrate equivalent or better ability to predict relevant non-test behaviours.

(3) The two scales should have the same internal structure, especially if there is reason to believe that the structure is not clearly unidimensional.

Eysenck & Eysenck (1975) introduced the Eysenck Personality Questionnaire (EPQ) as a major revision of the Eysenck Personality Inventory (EPI; Eysenck & Eysenck, 1968). The EPQ is a response both to theoretical development (by adding a psychoticism scale to the previously introduced extraversion and neuroticism scales) and psychometric criticisms.

Regarding the extraversion and neuroticism scales, the authors claim that 'the E and N scales of the present questionnaire are so similar to the corresponding scales of the other questionnaires that whatever has been discovered about correlates of E and N with the use of the older scales must be assumed to apply with equal force to the new scales' (Eysenck & Eysenck, 1975, p. 3). The fact that only 25 out of 57 items from the EPI appear on the EPQ, and that of these 25, eight have slightly altered wording (Helmes, 1980), suggests the need for empirical investigation of this claim. The trait of extraversion in particular has generated and continues to generate a great deal of research and theory. It is important to this research that investigators know whether or not the EPI and EPQ do in fact contain equivalent forms of the extraversion scale.

The traits of impulsivity and sociability are particularly relevant to an assessment of the

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equivalence of the extraversion scales of the EPI and EPQ. After a period of debate about whether extraversion is best thought of as a unitary construct or represents a 'shot gun wedding' (Guilford, 1975, p. 809) of impulsivity and sociability there seems to be general agreement at least that both can be identified as primary factors (Carrigan, 1960; S. B. G. Eysenck & H. J. Eysenck, 1978; S. B. G. Eysenck & Zuckerman, 1978; Revelle & Rocklin, 1979).

Along with this psychometric evidence identifying impulsivity and sociability as components of extraversion, a growing body of evidence demonstrates that the impulsivity component is responsible for many previous findings concerning the correlates of extraversion. Impulsivity bears a systematic relationship to vigilance decrements (Thackray *et al.*, 1974), caffeine-induced stress and verbal performance (Gilliland, 1976; Revelle *et al.*, 1980), driver safety (Loo, 1979*a*), and conditionability (H. J. Eysenck & Levey, 1972) while sociability does not display such systematic relationships. These findings suggest that Eysenck's arousal theory of extraversion (1967, 1976) is at least partly a theory of impulsivity. If an extraversion scale is to be used in testing predictions from this theory, it must represent a reasonable mix of impulsivity and sociability.

Method

The EPIs and EPQs of 838 college students who had participated in studies of personality and cognitive performance (some of which have been reported elsewhere: Craig *et al.*, 1979; Simon, 1979; Revelle *et al.*, 1980) were analysed. In addition to the EPI and EPQ, each student completed four experimental impulsivity scales (S. B. G. Eysenck & H. J. Eysenck, 1977). (A fifth group of items — liveliness — is also described. Whether this scale is a factor of impulsivity or sociability is ambiguous; it was not scored in the present study.) The four scales (narrow impulsivity, non-planning, risk-taking, and broad impulsivity, which is measured by the sum of the other three) resulted from a series of factor analyses of impulsivity items.

Some students participated for course credit, while others were paid. There were approximately equal numbers of males and females. Since other investigators have consistently found only minor, if any, sex differences in correlations between the scales of these two inventories (e.g. Howarth & Browne, 1972; Howarth, 1976; Loo, 1979*b*), only the aggregate results will be reported.

The data were analysed in two ways. First, product moment correlations were computed between the three scales of the EPI, the impulsivity and sociability subscales of the EPI E scale (the items comprising each subscale are given in Revelle *et al.*, 1980), the four scales of the EPQ, and the four experimental impulsivity scales. Next, the extraversion scales of the EPI and EPQ were factor analysed separately, using both oblique (oblimin) and orthogonal (varimax) rotations.

Results

The complete correlation matrix of EPI and EPQ scales is given in Table 1.

The minimal requirement that the two scales correlate highly is reasonably well satisfied ($r = 0{\cdot}74$). This value is similar to that reported elsewhere (Gilliland, 1976).

Examination of the relationship between the two extraversion scales and measures of impulsivity and sociability is less reassuring. The correlation between the two extraversion scales is due almost entirely to the correlation between EPQ extraversion and the EPI sociability subscale ($r = 0{\cdot}77$). The correlation between EPQ extraversion and the EPI impulsivity subscale is not appreciably different from the correlation between the impulsivity and sociability subscales ($r = 0{\cdot}39$ vs. $r = 0{\cdot}36$). Also, two of the four experimental impulsivity scales (narrow impulsivity and the total impulsivity score) are more closely related to EPI extraversion than to EPQ extraversion. This pattern of correlations suggests that the extraversion scale contained in the EPQ is a measure of sociability with little relationship to impulsivity.

Factor analysis of the items of the two extraversion scales also indicate substantial differences between them. Product moment correlation matrices were computed for the

Table 1. Correlations among personality scales

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) EPI impulsivity	—												
(2) EPI sociability	0·36	—											
(3) EPI extraversion	0·75[a]	0·84[a]	—										
(4) EPI neuroticism	0·12	–0·18	–0·07	—									
(5) EPI lie	–0·11	0·01	–0·08	–0·14	—								
(6) EPQ psychoticism	0·21	0·00	0·11	0·08	–0·14	—							
(7) EPQ extraversion	0·39	0·77	0·74	–0·20	–0·05	–0·03	—						
(8) EPQ neuroticism	0·01	–0·21	–0·16	0·83	–0·19	0·05	–0·20	—					
(9) EPQ lie	–0·18	0·00	–0·11	–0·19	0·65	–0·15	–0·02	–0·21	—				
(10) Narrow impulsivity	0·49	0·11	0·33	0·33	–0·24	0·35	0·15	0·32	–0·26	—			
(11) Risk-taking	0·42	0·26	0·39	0·12	0·07	0·25	0·32	0·08	–0·13	0·34	—		
(12) Non-planning	0·16	0·14	0·17	–0·18	–0·01	0·23	0·13	–0·23	–0·02	0·23	0·19	—	
(13) Broad impulsivity	0·52	0·23	0·42	0·14	–0·16	0·39	0·28	0·10	–0·20	0·78[a]	0·70[a]	0·64[a]	—

Note. $n = 838$. A correlation with a magnitude greater than 0·09 is significant at the 0·01 level.
[a] These correlations are inflated due to item overlap.

items of each scale separately and principal factors extracted. The Very Simple Structure criterion (VSS; Revelle & Rocklin, 1979; Rocklin & Revelle, 1980) was used to estimate the appropriate number of factors to extract. This criterion indexes the extent to which a factor pattern matrix which has had a simple structure imposed upon it re-creates the original correlation matrix. VSS has been shown to be more accurate than more commonly employed rules (e.g. the scree test or the eigenvalue less than one rule) when factoring items.

In employing either method of rotation the best solution for the EPQ extraversion scale was a single factor, (VSS = 0·927) while the best solution for the EPI extraversion scale required three factors (VSS = 0·741 for an oblique solution and 0·697 for an orthogonal solution). The content of the most salient items in the EPQ scale refers to liveliness, keeping in the background at a social event, being quiet when around others, and getting a party going. The three factors of the EPI extraversion scale can clearly be identified as sociability, impulsivity, and a two-item tautological factor concerning prank-playing. These last two items often appear as a separate factor in analyses of the EPI extraversion scale (Howarth & Browne, 1972; Revelle & Rocklin, 1979) although in some samples, they combine with the impulsivity factor (Revelle & Rocklin, 1978).

In a final effort to identify an impulsivity factor in the EPQ extraversion scale, a two-factor solution was computed and the content of the two factors examined. The first factor was defined by salients having to do with being talkative, lively, and able to get a party going. The second factor was characterized by items concerned with mixing with people, going out a lot, and enjoying parties. These are two slightly different factors of sociability, but neither is an impulsivity factor.

Discussion

The results leave no doubt that the extraversion scales of the EPI and the EPQ differ in important ways. Although scores on the two scales correlate rather highly, this correlation is due to the shared sociability content. The impulsivity subscale from the EPI is no more closely related to the EPQ extraversion scale than it is to the sociability subscale. Thus, whatever relationship there is between the EPQ extraversion scale and impulsivity as measured on the EPI is due to the inherent correlation between impulsivity and sociability. Further, the extraversion scale of the EPI is more closely related to Eysenck & Eysenck's experimental impulsivity scales (both 'narrow' and 'broad') than is the extraversion scale of the EPQ.

Examination of the internal structure of the two scales provides a converging line of evidence. The EPI scale is clearly not unidimensional, and two of the factors can be identified as sociability and impulsivity. On the other hand, the EPQ scale just as clearly *is* unidimensional. The correlational evidence discussed above and an inspection of the item content both suggest that this single factor is sociability. In some ways, it is not surprising that the EPQ's extraversion is a sociability scale. Of the nine impulsivity items on the EPI, only one (11 per cent) appears on the EPQ's extraversion scale. On the other hand, of the 13 sociability items on the EPI, six (46 per cent) appear on the EPQ's extraversion scale. The results of this study suggest that in an attempt to 'purify' the extraversion scale, Eysenck & Eysenck replaced impulsivity items with sociability items.

The distinction between impulsivity and sociability is important. Although psychometric methods will probably never settle the issue of whether extraversion is best thought of as a single construct or a mixture of impulsivity and sociability, experimental methods have shown that the two components of extraversion have entirely different patterns of results in a variety of paradigms. While impulsivity has been shown to have relationships relevant to the arousal theory of extraversion, sociability has not.

Given the evidence that the EPQ extraversion scale is a measure of sociability and the evidence that sociability is not systematically related to many of the arousal related correlates of extraversion, we are forced to conclude that in many instances, the EPQ scale will not display the predicted relationships to experimental manipulations even in otherwise well-designed studies. Gilliland's (1976) study provides an example of just such a failure. While extraversion as measured by the EPI was systematically related to verbal performance under caffeine-induced stress, the extraversion scale of the EPQ was not. This lack of parallel findings can be readily explained by the lack of impulsivity content in the EPQ scale.

The theoretical and psychometric bases of the psychoticism scale (Block, 1977*a, b*), the overall factor structure of the EPQ (Loo, 1979*b*; Helmes, 1980), and the social desirability correlates of the neuroticism and psychoticism scales (Helmes, 1980) have been criticized in the past. To this list we can add the criticism that in purifying the extraversion scale, Eysenck & Eysenck have changed its structure so that it is no longer an adequate measure of their theoretical construct. Although the EPQ extraversion scale is a psychometrically better scale than its EPI counterpart (in terms of factor structure and internal consistency), it is no longer a useful scale of experimental investigations of the arousal theory of extraversion.

We applaud the psychometric improvements of the EPQ E scale, but we feel that it is inappropriate to cite studies which made use of the EPI as providing evidence for the validity of the EPQ E scale. Until many of those studies have been replicated using the new scale, we encourage those interested in the arousal theory of extraversion to supplement the EPQ with impulsivity items taken from the EPI.

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