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A psychometric investigation of the Multidimensional Health Locus of Control questionnaire

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The validity of the alternate forms of the Multidimensional Health Locus of Control scale and the underlying dimensionality of the three test scales were investigated using 70 male and 77 female British university students. A classical item analysis, principal component and image component factor analysis were undertaken. The results indicated that the alternate forms could be considered parallel. However, a sex difference appeared in the factor structure of the test such that the male sample yielded only two factors while the female sample yielded the three scale factors as expected.

Recognizing the need for a situation-specific measure of internality–externality for the prediction of a certain behaviour, Wallston *et al.* (1976) developed a health locus of control scale. They claimed that the unidimensional Health Locus of Control (HLC) scale would provide a more sensitive prediction of the relationship between internality and health as opposed to the generalized I–E expectancy measure developed by Rotter (1966). The demonstration by Levenson (1973) of the utility of a multidimensional locus of control construct led Wallston *et al.* (1978) to review the original HLC scale and rewrite the items to measure three separate theoretical and empirically differentiated dimensions, reflecting the extent to which individuals perceive their health to be dependent upon their own behaviour; chance, fate, or luck; and powerful others. All the items were written in the personal mode since a strong case had been made by Levenson that beliefs about people in general should have less predictive power than beliefs about one's own control. Two equivalent versions of the new Multidimensional Health Locus of Control (MHLC) scale were developed to facilitate research designs involving repeated measures, but the two forms may be combined to provide a more reliable instrument. Reliability and validity for the two forms, A and B, are presented and discussed by Wallston *et al.*

The psychometric characteristics of the MHLC questionnaire, however, have not been fully explored by Wallston *et al.* The hypothesized dimensionality and parallelism of forms A and B were based entirely upon correlated evidence using total scale scores, as opposed to detailed analysis at the item level. This study investigates whether the MHLC scale measures three separate and distinct locus of control dimensions when used on a British population and also whether the two versions of the forms are equivalent.

Seventy male and 77 female Exeter University students individually completed both form A and form B of the MHLC questionnaire. Three subsamples of data were considered for detailed analysis: males, females and the joint sample. Initially each item and set of scale scores on form A was correlated with its equivalent on form B, then within-form correlations were computed. Scale reliabilities and item/scale correlations were also computed for each form. The results indicated that each of the scales was well defined by its items, with most item–total correlations greater than $1/\sqrt{n}$. However, for the male data, the majority of the internal items correlated significantly with the chance scale total score. To a lesser extent, the chance items correlated significantly with the internal scale total score. The results were the same for both forms and the data from the two forms correlated well together for all three subsamples. The mean cross-form item correlations were 0·48, 0·47 and 0·50 for the total, male and female samples respectively. The three cross-scale correlations for all subsamples were greater than 0·68 (tabled value at 0·001 level = 0·38).

Factor analyses were then carried out on the 18×18 correlation matrices for the three data subsets. Image and principal component factor analyses were employed. For both methods, two tests of factor extraction were undertaken. From consideration of the results of these tests, the retained factors were rotated using a modified direct oblimin procedure. This rotation was chosen especially because the solution is virtually unconstrained by the rotation method. Factor validity coefficients (Cattell & Tsuijoka, 1964) were also computed for each scale on both forms. If the questionnaire items were merely reworded counterparts of one or two basic items, the factor validity would be low.

The need for a minimum ratio of observations to variables, or of a minimum number of observations for stable factor patterns, has been challenged (Barrett & Kline, 1981). The most

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important appears to be the number of observations, with a minimum of 50 apparently yielding a clear, recognizable factor pattern. Small-sample factoring should only be carried out, however, when replicating a supposed factor structure. As this is the aim of the current study, the sample sizes involved are sufficiently large.

The factor extraction tests clearly indicated that three factors were contained in the female data. The adoption of a criterion of 0·5 for reliability of a factor meant that only two factors were extracted from the male data. Because of the sex difference, the total sample data were discarded from the analysis. The results for the two forms were highly comparable. In the principal components analysis, the three factors extracted from the female data accounted for 15·6, 15·0 and 13·5 per cent of the variance respectively on form A, and 15·1, 16·6 and 16·4 per cent on form B. The two factors for the male data accounted for 24·1 and 14·2 per cent of the variance on form A and 25·7 and 15·6 per cent of the variance on form B. In all cases the factor validity coefficients were greater than 0·90. For the female data the three factors were almost entirely defined by the items from the internal, chance and powerful others scales respectively. The male factors were defined (i) by the internal and chance scale items together, and (ii) by the powerful others scale items. There was very little contamination of factors by items from other scales. The results from the image analyses were very similar.

Investigating the combined data from forms A and B resulted in one major change to the results in that the male sample yielded three factors for both factoring techniques. However, the solution, although suggestive of the three scales, was not altogether 'clean' with internal and chance items accounting for the interference. In addition, the correlation between the 'internal' and the 'chance' factors was high. Thus a two-factor solution was rotated to simple structure. The results for the combined forms were hence directly comparable to the results for the individual forms, although the female data showed contamination from other scales too.

There are two major conclusions that can be drawn from the above analyses. Firstly, for both forms A and B, the male data consistently yielded only two factors, while the female data provided three, as hypothesized. Why a sex difference should exist in the responses to the items is not at all obvious. However, this sample consisted entirely of British university students, whilst that used by Wallston *et al.* (1978) consisted of American adult air travellers. Even so, the findings of this investigation mean that the MHLC should be used with caution. Note, however, that the structure produced for males in this study should not be treated as stable because the number of observations is sufficient to attempt replication of old structures, but insufficient to establish new ones. Secondly, and more positively, forms A and B can be said to be parallel with the dimensionality results being the same for both and the correlations between the forms being high. Also, the high factor validity coefficients indicate that the questionnaire items are not redundantly repetitious.

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References

Barrett, P. T. & Kline, P. (1981). The observation to variable ratio in factor analysis. *Personality Study and Group Behaviour*, **1**, 23–33.

Cattell, R. B. & Tsuijoka, B. (1964). The importance of factor-trueness and validity versus homogeneity and orthogonality in test scales. *Educational and Psychological Measurement*, **24**, 3–30.

Levenson, H. (1973). Multidimensional Locus of Control in psychiatric patients. *Journal of Consulting and Clinical Psychology*, **41**, 397–404.

Rotter, J. B. (1966). Generalised expectancies for internal versus external control of reinforcement. *Psychological Monographs*, **80** (1), 1–128.

Wallston, B. S., Wallston, K., Kaplan, G. D. & Naides, S. A. (1976). Development and validation of the Health Locus of Control (HLC) Scale. *Journal of Consulting and Clinical Psychology*, **44**, 580–585.

Wallston, K. A., Wallston, B. S. & De Vellis, R. (1978). Development of the Multidimensional Health Locus of Control (MHLC) Scales. *Health Education Monographs*, **6** (2), 160–170.

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