Reviewer's report

Title: Stress, burnout and doctors’ attitudes to work are determined by personality and learning style: A twelve year longitudinal study of UK medical graduates

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Reviewer: John J Kirby

Reviewer's report:

McManus et al. are to be congratulated for carrying out one of the more extensive longitudinal studies of university students' approaches to learning, and in particular for following the participants into the workplace and their careers. The results make a substantial contribution to educational psychology, in demonstrating the complex interplay of personality and learning processes, and a more specific contribution to medical education. Briefly, they demonstrate, using correlations, regression analyses and structural equation modelling, how doctors’ stress, burnout, and perceptions of their own learning/working environment are predicted by their personality and approaches to learning. The results are neatly summarised in their structural equation model, showing two partially-overlapping causal patterns: one stemming from neuroticism and low conscientiousness, through stress and a surface-disorganised approach to work, to perceptions of high workload, and a second, proceeding from extraversion and openness to experience, through a deep learning style at university, to a deep approach to their work and the perception of choice and independence in their work. The conclusion drawn by McManus et al. is that doctors’ stress and their perceptions of their approaches to work and their work environment are more caused by characteristics of the doctors that were present before they entered their workplaces than they are by actual differences in working conditions.

Because of the complex, multivariate and correlational nature of the data, there is more than one way to model the causal relationships addressed here. McManus et al. argue plausibly for their model, and the data and results are consistent with it; they also acknowledge some other models (page 10). However, one could argue for other models. Fortunately the authors have provided enough information in their Supplementary material to allow other researchers to test their own models. I recommend that the paper be accepted in its current form, subject to a number of Minor Essential Revisions and the authors’ consideration of various Discretionary Revisions.

Overall, this paper is the culmination of an extensive study, well based in the relevant literature and the authors' prior research. The methods are appropriate for the questions investigated; measures are described adequately, the response rate is typical for such studies, and the sample is extraordinarily large. Data from questionnaires are never cause for great confidence, but these seem to have been handled competently and efficiently. The manuscript is in very good condition, except for a few minor points listed below.
Discretionary Revisions
The points that I would like the authors to consider concern alternative conceptions of the causal structures underlying the data. These points should be seen more as comments upon the existing analyses than objections to them, and are intended to encourage further modelling of these and other data by these and other investigators. The basic structure of McManus et al.'s model is that personality causes approaches to learning and stress, which in turn cause approaches to work, which in turn cause perceptions of the working environment. This model may be critiqued both for its causal structure and for what it omits. With respect to structure, two issues stand out. First, as McManus et al. acknowledge, workplace perceptions may affect approaches to work in addition to being caused by them. The most obvious example would be a physician who is overwhelmed by workload and who as a result is unable to spend enough time to keep up with the field; this physician may well have been a deep learner under different circumstances. It seems plausible that causation here is reciprocal, as suggested by the developers of the AWQ and WCQ (Delva et al., 2003; Kirby et al., 2003); perhaps this should be acknowledged more explicitly. Second, the 'stress' variable shown in Figure 1 is one of a group of variables McManus et al. consider as a group. While the GHQ stress scale and two of the aMBQ scales (emotional exhaustion and depersonalisation) fit together, the third aMBQ scale (personal accomplishment) and the final scale (satisfaction with medicine as a career) seem quite different. These two seem also to be outcomes of the entire model rather than just causes of approaches to work and workplace perceptions. The correlation matrix in the Supplementary material shows that the first three are more related to each other than they are to the personal accomplishment scale; the correlations for satisfaction with medicine as a career are not provided (but should be).

No model can be complete, but it would be easier to judge how incomplete this one is if R2 values were given for each predicted variable. Moreover, there are important variables that are not in the model?obvious ones concern the participants' cognitive abilities, home circumstances, educational experiences, and actual working conditions. It would be beyond the scope of any one study to include all of this for such a large sample, but the absence of theoretically relevant variables suggests toning down the comments about stress or approaches to work being 'primarily' or 'largely?' caused by personality, etc.

The present study provides important evidence regarding the roles of internal factors in work satisfaction etc., and the authors provide a logical argument (page 12) that these results cannot be due to current working conditions. The authors are wise to emphasise, however, that the effects of personality or approaches to learning are not carved in stone. Some of these personal variables can change and education can lead some to overcome or bypass their underlying traits. The authors may wish to elaborate their paragraph on formal education and clinical experience (p 14); for example, Biggs (1999) has an extensive review of factors leading to higher quality university learning, including a consideration of the role of problem-based learning (largely in medicine) in fostering deeper learning (see also Delva et al., 2000). It is always helpful to remember that statistical results such as those
of the present study relate to the world in which the data were collected: a change in the world, such as improved education or changes in doctors' working conditions, may change the structural relations among constructs. One could quote Pope in response to Wordsworth (p 13):

This education forms the common mind:
Just as the twig is bent, the tree's inclined.
Alexander Pope, Moral Essays [1731-1735].
Epistle I To Lord Cobham [1734], l. 149.

Minor Essential Revisions (page, line number)
2, n-2 'Differences ... primarily reflect' The word primarily suggests that other measures were less predictive, but no other measures were used. Rephrase.
4, 16 'The AWQ bears a strong formal similarity to ...' This similarity is not accidental; Kirby et al. developed the AWQ by adapting items from Entwistle and Ramsden's (1983) Approaches to Study Inventory, a questionnaire with the same foci and structure as the Study Process Questionnaire used by McManus et al. Perhaps this should be clarified.
7, 5 correlating
9, 2 tables 1 and 3
9, 4 higher conscientiousness (unless the correlation shown in Table 3 (.126) should be negative).
9, 5-6 The deep approach to work is also predicted by lower emotional exhaustion (according to Table 1).
9, 9 tables 2 and 3
9, 16 The reference to the five 'stress measures' is confusing, since only one of them is stress and the others assess a number of other constructs, including career satisfaction. If these are to be grouped as stress this should be stated in the Method section, and the terms in the Tables may need amending. It would be clearer and simpler to rephrase the sentence on page 9.
10, n-4 'Stress is largely caused by personality differences'
The only other effects that were tested were those of approaches to learning at university (see Figure 1 and the table of beta coefficients in the Supplementary materials). Although the statement is correct, it may mislead some readers to think that may other predictors were tried and failed. The word largely also suggests that stress was almost completely predicted by personality; although the beta coefficients are large and significant (especially from neuroticism), they do not account for all of the variance in stress. That raises the question of how much variance is accounted for by the various predictors. I would like to see R2 values given for each of the predicted measures, either in Figure 1 or in the Supplementary material.
11, 6-8 '... a surface-disorganised approach occurs in neurotic, low conscientiousness individuals as a response to stress' [emphasis mine]. This statement describes the effect of a statistical interaction that was not tested. It would be more accurate to list the predictors (neuroticism, low conscientiousness, and stress). There is an indirect effect of neuroticism on surface-disorganised via stress, but this is not the same as an interaction.
14, 5 'causes rather than correlates' Presumably the authors mean 'causes rather than only correlates'

Supplementary material The correlation matrix (p 11) is missing the results for 'satisfaction with medicine as a career' ? these should be
References


Which journal?: Appropriate or potentially appropriate for BMC Medicine: an article of outstanding merit and interest in its field

What next?: Accept for publication in BMC Medicine after minor essential revisions

Quality of written English: Acceptable

Statistical review: No

Declaration of competing interests:

None