Motivational reserve: does it help our understanding of cognitive impairment?

Commentary on . . . Healthy brain ageing†

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Summary Motivational reserve is being proposed as an additional component of reserve capacities which may prevent, or ameliorate the effects of, cognitive impairment in later life. This is consistent with an understanding of the presentation of dementia which goes beyond neuropathological and neuropsychological changes. The construct may help make sense of findings relating to the potentially preventative qualities of a diverse range of 'cognitive' activities and of social networks, as well as of education. However, caution is required in relation to how cognitive impairment is evaluated and defined, to avoid confounds such as has been the case with level of education.

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As we consider a future where it becomes commonplace to live into what has been previously considered advanced old age, it is perhaps understandable that there is increasing attention on how we might avoid our final years being lost to dementia.

There have been numerous indicators of potential risk factors for the development of dementia, some of which seem fixed and others potentially modifiable. The concepts of 'brain reserve' and 'cognitive reserve' have been with us for some time;[1] do we need, as Maercker & Forstmeier (this issue) suggest, another form of reserve to assist our thinking about the factors that influence the development of cognitive impairment in later life?

From a psychological perspective, the 'use it or lose it' model is an attractive account for our times. It encourages us to liken the brain to a muscle, to be exercised through stimulating activities, computer gaming programmes that claim to reduce 'brain age', and even training regimes. There is relatively little evidence that cognitive training achieves any more than improved performance on the specific tasks undertaken in training,[2] and much of the evidence cited for the benefits of engagement in cognitive activities comes from reports of a greater level of activity among people who do not go on to develop cognitive impairment within the study follow-up period.

Stern makes a helpful distinction between brain reserve and cognitive reserve,[1] with the former being seen as passive, providing a higher threshold before the effects of any pathological changes have an effect. Cognitive reserve, in contrast, reflects an active process, involving more effective use of brain networks, and the use of alternative brain networks or compensatory strategies to maintain performance despite pathological changes.

On this basis, motivational reserve, as defined by Maercker & Forstmeier, appears to elaborate on the mechanisms of cognitive reserve and provides some useful pointers to factors that influence the promotion of neuropathological resilience. The increasing evidence that the extent and type of neuropathological impairment do not directly determine the degree of cognitive changes provides support for the dialectical theory of dementia proposed by Kitwood.[3] This theory highlighted the influence of the person's social environment, personality, life experiences and changes in physical health status on the presentation of dementia, and it was initially viewed as controversial in its rejection of a simplistic biomedical model.

It may be that considering motivational reserve will assist in further understanding the role of factors such as education in protecting against cognitive impairment. Typically, individuals with more years of education show lower risk of developing dementia; even among people who are subsequently shown to have Alzheimer's disease at a neuropathological level, those with longer education are less likely to have been diagnosed as having a dementia.[4] From a motivational reserve perspective, the concept of delayed gratification has immediate application to remaining in education for longer than the statutory requirement. The decision to remain in full-time education, based on putative future benefits, as opposed to entering the realm of paid employment at the first opportunity, may reflect, at least in part, the person's motivational resource. Years of education is, of course, a remarkably coarse marker of the extent of cognitive activity undertaken and may be influenced by

†See special article, pp. 175–177, this issue.

temporal factors such as an increase in the statutory school leaving age, increased availability of further education, or diminished opportunities in the employment market. Clearly, traits of conscientiousness and having a sense of purpose in life will likely contribute to educational and occupational attainment over the lifespan, alongside numerous other variables, including opportunity and changing gender-linked role expectations. The mechanisms that remain to be explored relate to the extent to which these motivational attributes have their primary effect through their role in maintaining a high level of cognitive activity and effort through life, effectively building a reservoir of connections and cognitive processes becoming automatic through extended usage. An alternative view might be that these attributes enable the person to bring a range of adaptable coping strategies to later life, allowing flexible coping and adaptation to a new set of difficulties relating to the development of cognitive impairment.

The motivational reserve concept is also helpful in considering some of the varied 'cognitive' activities that have been related in the literature to reduced risk of later developing dementia. These include reading, playing board games, playing musical instruments and dancing,[5] and reading newspapers or books, playing card games, doing crosswords and other puzzles, watching television and visiting museums.[6] These activities vary widely in their cognitive demands and the extent of effortful processing; perhaps the measures of frequency of activity used in these studies reflect as much the person's motivation to regularly participate and to identify discrete activities as they do the cognitive processing involved. A similar view might be taken of studies suggesting that people with larger social networks have a reduced risk of developing cognitive impairment.[7] There may well be motivational attributes that contribute to the maintenance of such networks across the lifespan, and a link with the extent of cognitive processing is even less readily apparent. The variety of risk factors now being identified reinforces the need for more large-scale studies of adults representing the general population. Studies of people from less representative populations (e.g. religious orders[6,8]) have been informative, but there may well be much more limited variance in educational levels and in sense of purpose.

Motivational reserve can then be seen as providing a welcome opportunity to view dementia and cognitive impairment as more than simply a function of neuropathological impairment or cognitive function. The drivers for maintaining cognitive performance, for adapting strategies and optimising performance, and for applying the still available cognitive resources (when it would be easier to give up) are to be found in an understanding of personality, biographical and motivational attributes. Mechanisms need to be postulated; in a biopsychosocial model, the role of motivational attributes such as self-regulation and self-control may simply be to protect the body and brain from the excesses of consumption of food, drink and drugs, referred to by Maercker & Forstmeier, or to maintain exercise with its benefits to cardiac (and brain) health. That in itself would be enough, perhaps, in that it might prevent or delay neuropathological impairment, but there is also the fascinating possibility of identifying those ways of coping and adjusting that add to years lived free of cognitive impairment.

A word of caution is needed, however, in this domain. This relates to the risk of entangling the risk factor and the diagnosis. This is most clearly seen in relation to education, where the assessment tools used to establish cognitive impairment are frequently confounded with educational level. Thus a person with a low educational level may score close to the threshold for an impaired score on a test of mental status before the onset of any dementia, whereas a person with high educational attainment may continue to score above the threshold on such a test long after detailed longitudinal neuropsychological assessment has documented clear cognitive impairment for that person. Tuokko and colleagues, from their analyses of data on the incidence of dementia from the Canadian Study on Health and Aging, a study of over 10 000 older people, conclude that the lower incidence of dementia for high-functioning people results primarily from such an ascertainment bias.[9] Furthermore, in studies of risk of developing 'dementia' or 'mild cognitive impairment', much depends on the specific definitions and thresholds adopted. In relation to mild cognitive impairment, for example, Stephan and colleagues showed that quite different groups of individuals were identified as having mild cognitive impairment,[10] depending on which of the numerous diagnostic definitions were used. It will be important to ensure that the lack of precision of our 'gold standard' categorisations is recognised, and that similar confounds to that evident in relation to education are not replicated with motivational attributes.

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References

1 Stern Y. What is cognitive reserve? Theory and research application of the reserve concept. *J Int Neuropsychol Soc* 2002; **8**: 448–60.

2 Owen AM, Hampshire A, Grahn JA, et al. Putting brain training to the test. *Nature* 2010; **465**: 775–8.

3 Kitwood T. The dialectics of dementia: with particular reference to Alzheimer's disease. *Age Soc* 1990; **10**: 177–96.

4 Roe CM, Xiong C, Miller JP, Morris JC. Education and Alzheimer disease without dementia: support for the cognitive reserve hypothesis. *Neurology* 2007; **68**: 223–8.

5 Verghese J, Lipton RB, Katz MJ, Hall CB, Derby CA, Kuslansky G, et al. Leisure activities and the risk of dementia in the elderly. *N Engl J Med* 2003; **348**: 2508–16.

6 Wilson RS, Mendes De Leon CF, Barnes LL, Schneider JA, Bienias JL, Evans DA, et al. Participation in cognitively stimulating activities and risk of incident Alzheimer disease. *J Am Med Assoc* 2002; **287**: 742–8.

7 Crooks VC, Lubben J, Petitti DB, Little D, Chiu V. Social Network, cognitive function, and dementia incidence among elderly women. *Am J Publ Health* 2008; **98**: 1221–7.

8 Snowdon DA. Healthy aging and dementia: findings from the Nun study. *Ann Intern Med* 2003; **139**: 450–4.

9 Tuokko H, Garrett DD, McDowell I, Silverberg N, Kristjansson B. Cognitive decline in high-functioning older adults: reserve or ascertainment bias? *Aging Ment Health* 2003; **7**: 259–70.

10 Stephan BCM, Matthews FE, McKeith IG, Bond J, Brayne C. Early cognitive change in the general population: how do different definitions work? *J Am Geriatr Soc* 2007; **55**: 1534–40.

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