Quality of Life and Real Life Cognitive Functioning
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This study examined the predictive value of mid-life risk factors for cognitive functioning in old age. Participants were drawn from a study of middle-aged people living in Paisley and Renfrew conducted 30 years ago. Current cognitive functioning, both 'abstract' and 'real world', was assessed, along with attitudes and beliefs regarding how to maintain cognitive functioning in old age. Cognitive functioning was then examined in relation to perceived quality of life.

Summary of key findings
- Mid-life lung function, a measure of 'biological ageing', was associated with some aspects of 'abstract' cognitive functioning in old age.
- Mid-life blood pressure, cholesterol, blood glucose, and body mass were not strong predictors of cognitive functioning in old age.
- Morbidity history was not correlated with late-life cognitive functioning.
- Those who rated their current physical health as good or excellent performed better on tests assessing a 'speed' component of abstract cognitive functioning.
- Most of the older people in this study expressed the view that keeping active, interested, reading, doing puzzles, socialising and keeping healthy could help to prevent cognitive decline in old age.
- Over half of the participants deliberately engaged in specific activities to maintain good cognitive functioning.
- Engagement in mental activities, even if not deliberately undertaken to prevent decline, was found to be associated with better performance on the 'speed' tests of abstract cognitive functioning.
- Engagement in physical and social activities was not associated with better performance on any of the tests of cognitive functioning.
- Better performance on the 'real world' problem solving tasks was associated with higher self-ratings of quality of life. Performance on 'abstract' tasks was not correlated with perceived quality of life.

Aims of the research
- To determine the predictive value of risk factors measured in mid-life to 'real world' and 'abstract' cognitive functioning in old age.
- To determine the impact of morbidity history on current cognitive functioning.
- To examine lay concepts of factors influencing cognitive functioning in later life.
- To examine the degree to which older people engage in specific behaviours to maintain and enhance cognitive functioning in old age.
- To examine the relationship between cognitive functioning and perceived quality of life.
The main findings

The main findings are presented as answers to the key questions that guided the study.

Q.1 – To what extent do risk factors measured in mid-life predict cognitive functioning in old age?

Few of the risk factors measured in middle age predicted cognitive functioning in old age. FEV1, a measure of lung capacity that is often viewed as a good measure of biological ageing, was significantly correlated with some individual tests of 'abstract' cognitive functioning, as well as with a factor labelled 'verbal' cognitive functioning. Cholesterol levels measured in mid-life were associated with digit substitution and matrix reasoning, but at the factor level were not associated with any of the three cognitive functioning factors. Social class in mid-life was significantly associated with performance on almost all of the individual tests of cognitive functioning, as well as with the factors 'speed' and 'verbal'.

Q.2 – To what extent do current risk factors and current health predict cognitive functioning in old age?

Lung function (FEV1) was significantly correlated with only one measure of cognitive functioning, WAIS matrix reasoning. Current smoking was associated with digit substitution, with those who smoked doing least well. Deprivation category was associated with performance on almost all of the individual tests of cognitive functioning, with those in the most deprived areas performing less well than those in the more affluent areas. Age was correlated with most of the measures of cognitive functioning. Several of the self-ratings of current health were also associated with test performance; ratings of mental health and daily function showed the strongest links with performance on the tests of cognitive functioning. The factor 'self-rated health' was associated with the 'speed' factors, but not with the 'verbal' and 'real world problem solving' factors.

Q.3 – Is morbidity history associated with current cognitive functioning?

No. Comparisons between those classified as 'healthy' and 'unhealthy' based on morbidity history indicated no significant differences in performance on any of the tests of cognitive functioning.

Q.4 – To what extent is cognitive functioning associated with perceived quality of life?

At the level of individual tests there was little evidence that cognitive functioning is strongly associated with quality of life. However, at the factor level, performance on the real world problem-solving task was significantly associated with the quality of life factor. Self-rated cognitive functioning was also significantly associated with quality of life.

Q.5 – Are 'real life' problem-solving abilities better predictors of perceived quality of life than traditional psychometric abilities?

Yes. The real world problem solving score was the only cognitive functioning factor that significantly predicted the overall quality of life measure.

Q.6 – To what extent are self-ratings of current health associated with perceived quality of life?

As with previous studies, this study found that self-rated health was associated with quality of life in old age, with those rating their health as better reporting higher quality of life. Health status as determined by morbidity history was also associated with quality of life.

Q.7 – What do older people think can be done to prevent cognitive decline in old age?

Most participants were able to list something that they thought could maintain good cognitive functioning in old age, indicating some belief that cognitive decline is not inevitable. Keeping active, busy, and interested were viewed as important by the older people in this study. Crosswords and puzzles were seen as useful in preventing cognitive decline. Physical activity and general good health appeared to be slightly less salient, but were noted by a higher proportion of the respondents as the second and third possible means of maintaining good cognitive functioning.

Q.8 – To what extent do older adults deliberately engage in physical and mental activities to prevent cognitive decline?

Sixty per cent reported that they deliberately engaged in activities to prevent cognitive decline. Mental activity, rather than physical activity, was favoured.

Q.9 – Are there associations between self-ratings of cognitive functioning, perceived changes in cognitive functioning, and performance on tests of current cognitive functioning?
At the level of individual tests of cognitive function¬ing there appeared to be only a weak association between self-ratings of current cognitive functioning and performance on the tests of cognitive function¬ing. However, at the factor level, self-ratings were sig¬nificantly associated with the 'speed' and 'verbal' factors, but not with the 'real world problem-solving' factor. Ratings of perceived changes in cognitive functioning showed weak association with performance on the tests of cognitive functioning.

Q.10 – Are there any associations between phys¬ical, mental and social activities undertaken, cognitive functioning, and quality of life?

Mental activities were associated with matrix reasoning, digit substitution and category fluency and with the factor 'speed'. Physical and social activities were not correlated with any of the tests of cognitive functioning. Activity levels were not associated with quality of life.

Q.11 – Which of the following variables inde¬pendently predict perceived quality of life: mid¬life risk factors, morbidity history, current health, current risk factors, cognitive function¬ing, current levels of mental, social and phys¬ical activity?

At the factor level real world problem solving, health status/morbidity history, self-rated health, and self-rated cognitive functioning were independent predictors of quality of life.

The findings overall were complex, as can be seen in Figure 1 (see insert).

How the research was carried out

Sample

The sample consisted of 145 older people (age range 70 to 91 years) drawn from the original Paisley¬Renfrew Epidemiological Study (known as MIDSPAN). The MIDSPAN study was conducted 30 years ago and included over 15,000 middle aged (45-64 years) people living in Paisley and Renfrew. The sample was stratified by gender, age and 'health status' (healthy vs. unhealthy) as indexed by morbidity history.

Procedure

Semi-structured interviews, along with a battery of tests of abstract and real world cognitive functioning, were conducted. Three sessions were required with each participant. Assessment of current cognitive functioning required two three-hour testing sessions; a further two-hour interview gathered data on attitudes and behaviours associated with maintaining good cognitive functioning in old age.

Measures

Mid-life Risk Factors:
- Forced Expiratory Volume (FEV1)
- Blood glucose level
- Diastolic blood pressure
- Cholesterol
- Systolic blood pressure
- Smoking
- Body Mass Index
- Social Class

Current risk factors:
- Forced Expiratory Volume (FEV1)
- Pulse
- Diastolic blood pressure
- Deprivation
- Systolic blood pressure
- Category

Cognitive functioning:
- National Adult Reading Test
- BADS Zoo test
- FAS verbal fluency
- Category fluency
- Paisley reading comprehension
- WAIS matrix reasoning
- WAIS digit substitution
- Rey's Audio Verbal Learning Task

In addition, real world problem solving tests of two types were developed specifically for this study: everyday problem solving and socio-emotional problem solving. The real world problem situations were developed through extensive piloting with older people. The problems consisted of short vignettes in which study participants were asked to give as many different solutions as possible. The answers were scored for numbers of solutions and quality.

A 50-year old man who has recently married has discovered that his new wife has a drink¬ping problem which results in her being abu¬sive and violent. He does not know how to cope with this problem.

What should he do?

Social and emotional problem solving were measured in order to examine the hypothesis that these aspects of functioning are stronger determinants of old-age quality of life than cognitive functioning. There is some evidence that emotional and social problem solving may be less affected by the process of ageing than abstract tasks. However, it is not clear whether intact social-emotional functioning in the face of cognitive decline helps older people to main¬tain high morale and a good quality of life.
Beliefs and Behaviours – Perceptions of current cognitive functioning and changes in cognitive functioning were assessed along 13 dimensions, e.g. ability to remember things for a short time, ability to remember when to do things, ability to make decisions, ability to concentrate. In addition, reported engagement in 26 specific activities, grouped into mental, physical and social, were recorded. Example activities include: Mental: reading newspapers, playing cards, playing chess, doing crosswords; Physical: swimming, dancing, gardening; Social: seeing friends, seeing relatives, attending social clubs.

Self-rated health – A questionnaire asking for self-ratings of health along a number of dimensions (physical, mental, daily functioning, etc) was sent to participants at the start of the study.

Quality of life – Quality of life was assessed using the following measures: LEIPAD, an internationally validated assessment for older adults, and the Delighted-Terrible Faces scale.

In addition, current affective state was assessed at time of testing using the Hospital and Anxiety Depression Scale.

Analyses
Initially analyses were carried out at the level of variables (e.g. inter-correlations between individual variables). Later analyses were carried out at the level of factor scores and composite variables. Factors were derived for the tests of current cognitive functioning, current health ratings, the ratings of current cognition, the quality of life measures, current risk factors, and MIDSPAN risk factors. Composite scores were derived for the activity measures. Using composite and factor scores helped establish broader patterns that may not be clear at the level of individual variables.

Conclusions
The findings present a complex picture of the relationship between mid-life risk factors and cognitive functioning in old age. The relationship between cognitive functioning and perceived quality of life was also complex, but it was interesting that 'real world' cognitive functioning was a better predictor of quality of life than 'abstract' cognitive functioning.

Research staff
Professor Gilhooly is Director of the Centre of Gerontology and Health Studies, University of Paisley. Dr Louise Phillips is a lecturer, Department of Psychology, University of Aberdeen. At the time the study was conducted Professor Ken Gilhooly was Head of Psychology, Brunel University; he is now Professor of Psychology, University of Paisley. Professor Phil Hanlon is Director, Public Health Institute for Scotland. Investigators on this project were: Dominique Harvey, Allison Murray, Karen Dunleavy, Margaret Lothian, Susan Caldwell, Eileen McDonach (Centre of Gerontology and Health Studies, University of Paisley) and Bruce White (Public Health Institute for Scotland). Dr Carole Hart, Glasgow University provided data from the original MIDSPAN study. The help of Dr Leslie Wilkie, Director of Public Health, and her staff at the Argyll and Clyde Health Board, was invaluable.

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Published by the
ESRC Growing Older Programme
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Elmfield
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Growing Older Programme web site: http://www.shef.ac.uk/uni/projects/gop/index.htm