Factors and predictors of cognitive impairment in the elderly

A synopsis and comment on “Systematic Review: Factors associated with risk for and possible prevention of cognitive decline in later life”

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ABSTRACT

The sixth column on Evidence-Based Behavioral Medicine is focused on Plassman et al.’s (*Ann Internal Med* 153:182–193, 2010) systematic review on factors associated with risk for and prevention of cognitive decline among the elderly. A total of 250 studies were included in the final analyses. Cognitive training was most consistently and negatively associated with cognitive decline. Evidence was largely consistent across observational and randomized controlled trial (RCT) studies. Other factors, such as physical activity, some healthy nutritional patterns, and not smoking might also be protective against cognitive decline, but the available evidence is not adequate to draw conclusions about the strength of these relationships. Future research addressing these limitations should include well-designed RCTs that attempt to replicate the finding that cognitive training is protective, and well as high-quality observational and interventional studies that examine the impact of health behaviors on cognitive decline.

KEYWORDS

Cognitive decline, Elderly, Risk factors, Prevention

INTRODUCTION

The sixth column on Evidence-Based Behavioral Medicine (EBBM) presents a synopsis of the systematic review by Plassman and colleagues [1] summarizing the evidence on the risk and preventive factors for cognitive decline among elderly individuals. A synopsis is a very brief description of an original article or review, which conveys findings in an efficient format. Synopses illustrate the secondary, synthesized infrastructure of evidence-based practice that makes pre-appraised primary research findings accessible to a broad audience of end users [2].

Cognitive decline among the elderly is an important problem given its association with the development of mild cognitive impairment (MCI) and dementia. Further, cognitive decline places individuals at a greater risk for decreased quality of life and increased disability. Considerable evidence points to biological,

Implications

Researchers: Researchers studying cognitive decline should reach consensus on measurement of outcomes and risk and protective factors.

Practitioners: Cognitive training and positive health behaviors hold potential to protect against cognitive decline.

Policy Makers: Policy makers should support the development of a needed evidence base to guide community management of the growing elderly population.

behavioral, social, and environmental variables that correlate to increased risk for the development of cognitive decline. This systematic review examines whether the existing evidence is adequate to inform practice recommendations for older patients.

KEY QUESTIONS

The National Institutes of Health (NIH) Office of Medical Applications of Research (OMAR) State-of-the-Science Conference planning committee developed 6 original key research questions. The systematic review addresses two of those six questions:

First question: “What factors are associated with the reduction of risk of cognitive decline in older adults?”

Second question: “What are the therapeutic and adverse effects of interventions to improve or maintain cognitive ability or function? Are there different outcomes in identifiable subgroups?”

SEARCH STRATEGY

The literature search focused on English-language publications between 1984 and October 27, 2009. The databases were MEDLINE and the Cochrane Database of Systematic Reviews. A separate search strategy was developed for the genetics literature, by which the HuGEpedia and AlzGene databases were used to identify systematic reviews that focused on

special interest genes. Inclusion criteria for these studies were adults 50 years or older, economically developed countries, a sample size of at least 300 for cohort studies and 50 for randomized controlled trials (RCTs), and at least 1 year between exposure and final outcomes assessment. Inclusion criteria differed for the specific Key Questions. For the first question, study design was restricted to prospective cohort studies. However, in cases where cohort studies were absent or limited (i.e., traumatic brain injury, toxic environmental exposures, and sleep apnea), case-control designs were included. For the second question, study design was restricted to RCTs.

QUALITY ASSESSMENT

For systematic reviews, the authors used the quality assessment guidelines described in the User's Guides to the Medical Literature on systematic reviews. For RCTs, they adapted the key criteria of the Agency for Healthcare Research and Quality (AHRQ) methods manual for comparative effectiveness reviews. For observational studies, they adapted a set of quality criteria previously used in AHRQ evidence reports. The criteria included the following: methods of cohort selection, sample size, methods of ascertaining exposure status and outcomes, adequacy and completeness of follow up, and the suitability of data analytic techniques.

DATA SYNTHESIS AND ANALYSIS

Because of the heterogeneity of classification systems for cognitive decline, the authors evaluated studies that reported continuous measures for each exposure. The data was not quantitatively summarized because of the marked heterogeneity of categorical outcomes.

RESULTS

A total of 250 studies were included in the final analyses. Of these, 127 were observational studies investigating factors associated with risk for cognitive decline; 22 were RCTs testing the efficacy of interventions to improve cognitive functioning; and 16 were systematic reviews. Factors were placed into five main categories: nutritional; medical; social, economic, or behavioral; toxic environmental; and genetic factors. There were many inconsistencies regarding how "cognitive decline" was operationally defined across studies. For example 10% defined cognitive impairment as "incident MCI" or "cognitive decline without dementia," 40% determined diagnosis based on performance on a single cognitive measure, 40% defined it based on results of multiple neuropsychological measures, and 10% defined cognitive decline based on "a composite global index of performance." Given the inconsistent definition of cognitive decline,

the authors were unable to synthesize and interpret data from the systematic reviews. However, data from the observational studies revealed that smoking and having a diagnosis of diabetes predicted risk for cognitive decline. Some other possible risk factors based on observational studies were apolipoprotein E ϵ 4 allele, depressive symptoms, and metabolic syndrome. Involvement in cognitive training (e.g., completing exercises specifically designed to improve areas of cognitive functioning) and physical activity, as well as a "Mediterranean diet" with high vegetable and Omega 3 fatty acid consumption, are probably preventive against cognitive decline. Evidence from RCTs was not as consistent, but also found that cognitive training might protect against cognitive decline. For each factor, the authors assigned a quality rating for the evidence across studies. They assigned a "low" quality grade to a majority of the factors.

CONCLUSIONS

The authors conclude that, of the factors examined, cognitive training is most consistently and negatively associated with cognitive decline. Evidence was largely consistent across observational and RCT studies. Other factors, such as physical activity, some healthy nutritional patterns, and not smoking might also be protective against cognitive decline, but the available evidence is not adequate to draw conclusions about the strength of these relationships.

COMMENT

Findings from this review identify one *probable* (cognitive training) and several *possible* risk and protective factors for the development of cognitive decline. Limitations of the literature include: lack of standardized measures for cognitive decline, making it difficult to synthesize the data across studies, and lack of longitudinal studies. Measures of exposure also lack standardization. Future research addressing these limitations should include well-designed RCTs that attempt to replicate the finding that cognitive training is protective, and well as high-quality observational and interventional studies that examine the impact of health behaviors on cognitive decline. Although no clinical implications can be drawn from this review, potential associations between cognitive training, health behaviors and cognitive decline warrant further investigation.

1. Plassman BL, Williams JW, Burke JR, Holsinger T, Benjamin S. Systematic review: factors associated with risk for and possible prevention of cognitive decline in later life. *Ann Intern Med.* 2010;153:182-193.
2. Haynes R. Of studies, syntheses, synopses, summaries, and systems: the "5S" evolution of information services for evidence-based health care decisions. *Evid Based Nurs.* 2007;10:6-7.