Midlife Hearing, Vision, Olfactory, and Motor Function Improve the Long-Term Prediction of Cognitive Decline and Onset of Cognitive Impairment

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INTRODUCTION

• Dementia has a long preclinical phase; pathological changes can start decades before symptoms.
• Elderly detection of high-risk individuals in midlife has great potential for future targeted treatments and prevention but we currently lack non-invasive, low-cost screening tools.
• Sensory (hearing, vision, olfaction) and motor changes are common in aging adults and have been associated with cognitive impairment and dementia.
• Previous risk factors used for prediction of impairment have often been based on cardiovascular-related factors and did not include sensory or motor measures.

AIM

We aimed to assess whether midlife sensory and motor function can improve risk prediction models of 10-year cognitive decline and impairment.

METHODS

Study Sample

Participants who underwent neurocognitive review using their data from baseline (2005-08), 5-year (2010-13) and 10-year (2015-17) follow-up were included in analysis N=1529

Measurements

Baseline Risk Scores

CAIDE (Cardiovascular Risk Factors, Aging, and Dementia Study) Score:
• Includes age, sex, education, blood pressure, total cholesterol level, physical activity, body mass index, FRS5% (Framingham Risk Score) score.
• Includes age, sex, blood pressure, blood pressure medication intake, total cholesterol levels, high-density lipoprotein levels, current smoking status, diabetes

Baseline Sensory and Motor Measures

Hearing:
- Pure-tone audiometry (500-4000Hz averaged); Impairment: >25dBHL

Vision:
- Contrast sensitivity-Pelli-Robson letter chart; Impairment: <1.5 log units

Olfaction:
- San Diego Olfactory Identification Test, Impairment: <6 odor correct

Motor Function:
- Grooved Pegboard Test, s; (Lafayette, Instruments, Lafayette, IN5,11)
- Grip strength hand dynamometer, kg. (Lafayette, Instruments, Lafayette, IN5,11
- 36-item Short Form Survey (SF-36) Physical Function Scale, Score,3

Cognitive Outcomes

10-year cognitive decline: Trail-making Test B time, 10% most decline,12
10-year incidence of cognitive impairment: determined by clinical/neurocognitive expert review panel

Statistical Methods

Logistic regression models
- Outcomes: 10-yr incidence of cognitive decline or impairment
- 1. Model: Determinants: CAIDE or FRS5%

Chi-square test to assess significance in increase in risk prediction models (AUCs), p-value

Table 1. Sample Characteristics (N=1529; 67%)

Baseline mean age: 65, 50-10 years, range 22-94
523 (44)
628 (46)
Average 9.6 years of follow-up
Incident Cognitive Decline 167 (11)
Incident Cognitive Impairment 248 (16)

METHODS & RESULTS

Including midlife hearing, vision, olfactory, and motor function improved the risk prediction of long-term cognitive decline and impairment.

DISCUSSION

- Adding sensory and motor measures improved AUROC’s for predictions of cognitive decline and cognitive impairment as compared to models using only the CAIDE or only the FRS5%, two previously used risk factors scores.
- This extends previous research to the inclusion of sensory and motor measures assessed in midlife into the long-term prediction of cognitive changes and onset of impairment.
- Sensory and motor assessments could potentially become relevant cost-effective and non-invasive screening tools to identify those at high risk for neurodegeneration and cognitive decline early to target future prevention and intervention strategies.

Limitations
- Rather healthy cohort, with limited impairment/ change
- Non-Hispanic White cohort
- Subsample of the BOSS
- Strengths
- Large well-characterized sample
- Longitudinal data starting in midlife with 10 years of follow-up
- Large battery of standardized objective assessments

CONCLUSION

Including midlife hearing, vision, olfactory, and motor function improved the risk prediction of long-term cognitive decline and impairment in middle-aged to older adults.

FUTURE DIRECTIONS

- Future studies should follow participants into older ages, with higher incidences of cognitive changes and clinical impairment
- Future research might also explore additional sensory measures to build stronger yet parsimonious prediction models.

REFERENCES & ACKNOWLEDGEMENTS

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