Cognitive impairment (CI) is the fifth leading cause of disability in older adults, with associated substantial personal, societal, physical, and psychosocial burden. Given its associated widespread and deleterious consequences, identifying potentially modifiable factors associated with the risk of CI is essential for reducing the burden of disease. Recent cross-sectional and longitudinal findings have established visual impairment (VI) as a potentially modifiable factor associated with the risk of CI, which suggests that public health strategies targeting early detection and the management of VI may be appropriate risk-reduction approaches to prevent the onset of CI. Nevertheless, a major limitation of the association between VI and CI is that research has focused mostly on 1 aspect of the visual function system (VFS)—that is, visual acuity—whereas other components, such as contrast sensitivity, stereo acuity, color vision, and visual fields, all of which decline with age, are relatively unexplored, despite some evidence of their importance in CI development.

Recognizing this limitation, we read with interest the recent findings by Varadaraj and colleagues. The authors evaluated the association between vision and cognitive decline across 3 measures of VFS (visual acuity, contrast sensitivity, and stereo acuity) and multiple cognitive domains (language, memory, attention, executive function, and visuospatial ability) using longitudinal data from the Baltimore Longitudinal Study of Aging. The study demonstrated that poor visual and stereo acuities at baseline were associated with significant decrements in language and memory functions, whereas poor baseline contrast sensitivity was linked with substantial decline in several cognitive domains, including language, memory, attention, and visuospatial ability. Taken together, these results suggest that the association between vision and cognition differs between components of VFS and that impaired VFS components may be important clinical markers of cognitive decline.

Varadaraj and colleagues further highlight the unmet clinical and research need of evaluating other components of the VFS, apart from visual acuity (the most common clinically assessed element of vision), to investigate the impact of vision and vision-related interventions on cognitive decline. Although the results of this study are of great interest, it should be noted that other VFS components, such as visual field and color vision, were not included, which may limit the study's main conclusion that impaired contrast sensitivity is associated with declines across several cognitive domains. Future studies investigating the association between the spectrum of VFS components and cognitive domains are needed to confirm the study's findings. Critically, the cumulative impact of the deterioration in multiple aspects of the VFS needs further work. This information may provide important evidence to support a more comprehensive clinical assessment of the VFS as part of a public health strategy for early detection and management of cognitive decline in older adults with VI.

Notwithstanding the interesting finding of Varadaraj and associates that patterns of cognitive decline differ by visual function components, it needs to be highlighted that most current neuropsychological tests requiring visual inputs. Importantly, it has been established that this visual dependence may contribute to worse cognitive performances in individuals with compromised vision, reflecting VI rather than CI. Furthermore, individuals with VI have been shown to perform better on vision-independent cognitive tests. As such, although impaired contrast sensitivity was associated with declines across several cognitive domains, they all were vision-dependent tests. It is thus difficult to infer whether the worse
cognitive scores in older adults with impaired contrast sensitivity, compared with those with other VFS measures, was due to impaired contrast or CI. To overcome this challenge, the Varadaraj et al performed sensitivity analyses by excluding vision-dependent tests from each cognitive domain, and the findings were unchanged. Although the results are encouraging, test deletion resulted in the omission of the entire visuospatial domain, which may compromise the validity of their sensitivity analyses. Therefore, test exclusion may not be a valid substitution for a well-designed neuropsychological test battery tailored for visually impaired individuals, which is currently unavailable. As such, future research is needed to develop and validate a novel vision-independent neuropsychological battery to accurately evaluate CI in visually impaired older adults.

Another important challenge in disentangling the complex relationship between VI and CI is whether VI is associated with global cognition or specific cognitive domains. For the former, most studies investigating the impact of VI on global scores have relied on cognitive screening tools, such as the Mini-Mental State Examination, which are less accurate, compared with the reference standard of clinical evaluation in agreement with international consensus criteria. For the latter, the results remain equivocal, possibly because of the heterogeneity in participants’ characteristics and research methods. To further elucidate the associations between the VFS with global cognition and specific cognitive domains, future studies could integrate an assessment of cognition in visually impaired older adults using a vision-independent neuropsychological battery as part of the clinical evaluation of CI performed by clinicians following international consensus criteria. This new battery may strengthen our understanding of this complex association between VI and CI and allow for targeted and personalized management for either global cognitive decline or specific cognitive domain impairment in patients with concomitant VI and CI.

In conclusion, Varadaraj and colleagues have reported that patterns of cognitive decline differ by the components of VFS. These noteworthy results suggest that future studies should refocus the clinical evaluation to integrate comprehensive assessment of visual and cognitive functions in older adults to evaluate the complex association between VI and CI. Such extensive evaluation may allow for targeted and personalized management plans for older adults with concomitant VI and CI.

ARTICLE INFORMATION

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REFERENCES
