

DOES INTERMITTENT EXPOSURE TO HIGH-ALTITUDE CAUSE PERSISTENT COGNITIVE IMPAIRMENT IN MOUNTAINEERS? A SCOPING REVIEW



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BACKGROUND

Exposure to hypobaric hypoxia at high-altitude (HA) can impair cognition, but whether these effects persist or manifest following return to sea level (RSL) remains open to debate¹.

OBJECTIVES

To map the existing literature regarding intermittent HA exposure and persistent cognitive impairment in mountaineers to:

- Recognise current knowledge.
- Identify research limitations and gaps.
- Inform future studies.
- Seek how cognitive impairment is defined and assessed.

METHODS

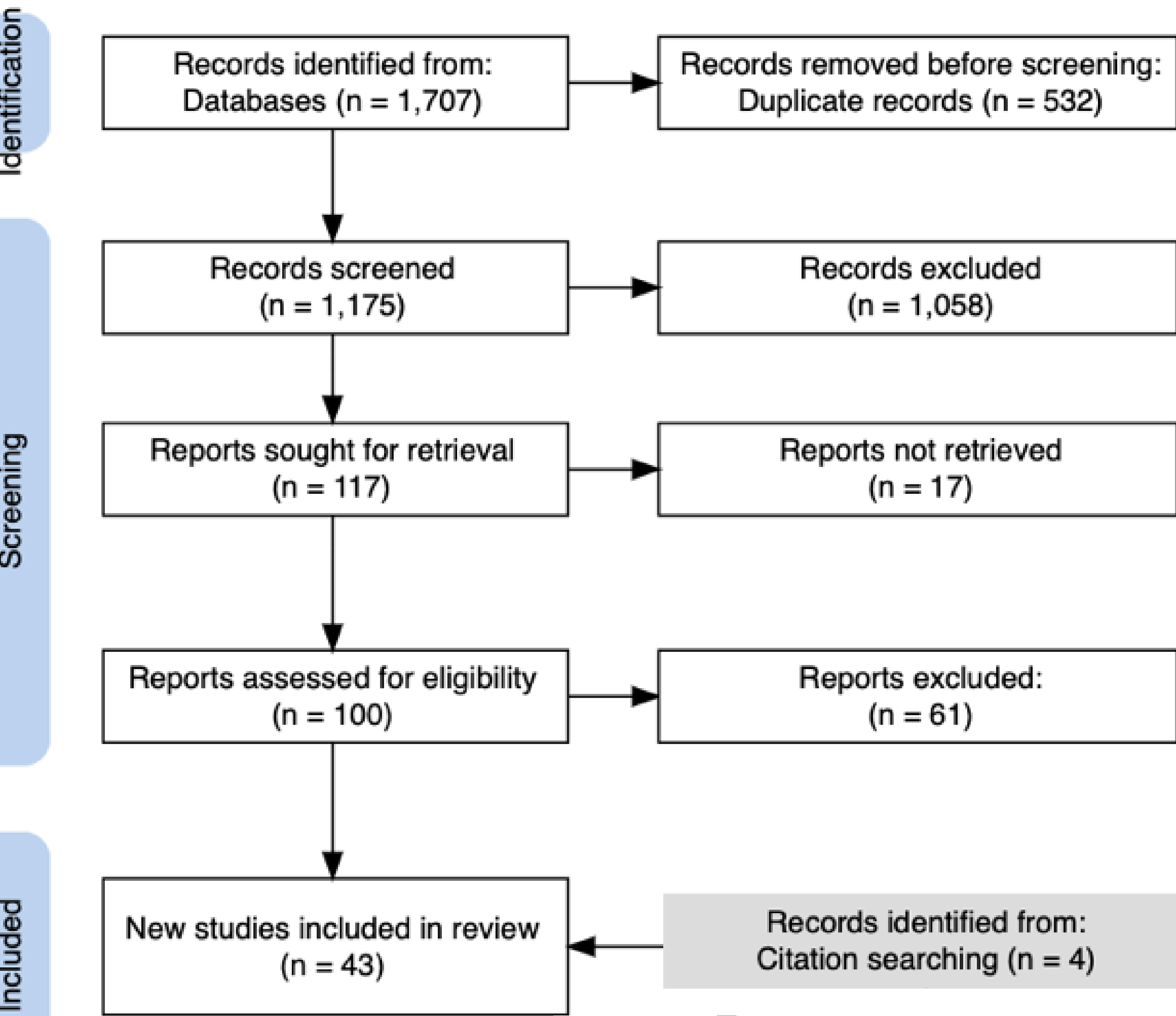
Study design: Scoping review

Protocol: Based on the Arksey and O'Malley framework².

Eligibility: Studies of mountaineers ≥ 18yo residing <1500m with exposure to HA (≥1500m) who were assessed for cerebral impairment that persisted following RSL by test-based neurocognitive assessment and/or MRI brain imaging.

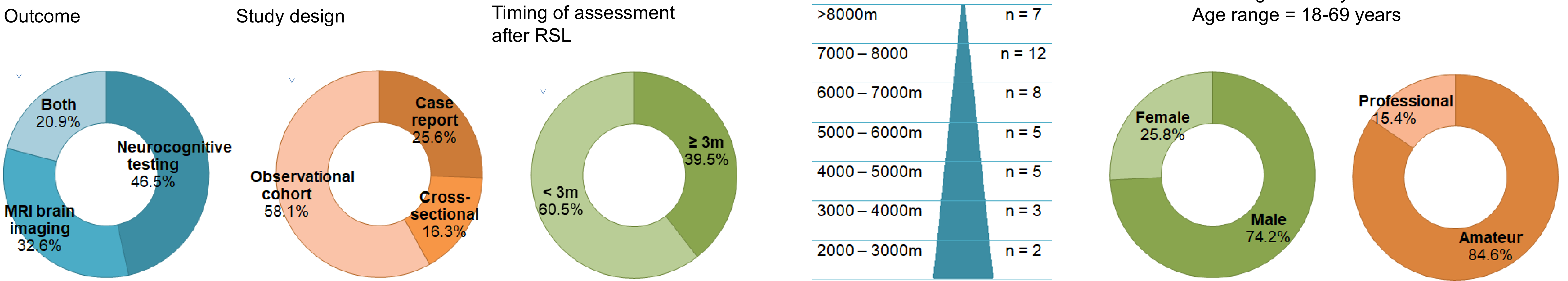
Data sources: Electronic search of Pubmed, Scopus, Web of Science and Embase from inception to May 2024. Reference and citation search of included papers.

PRISMA Flowchart

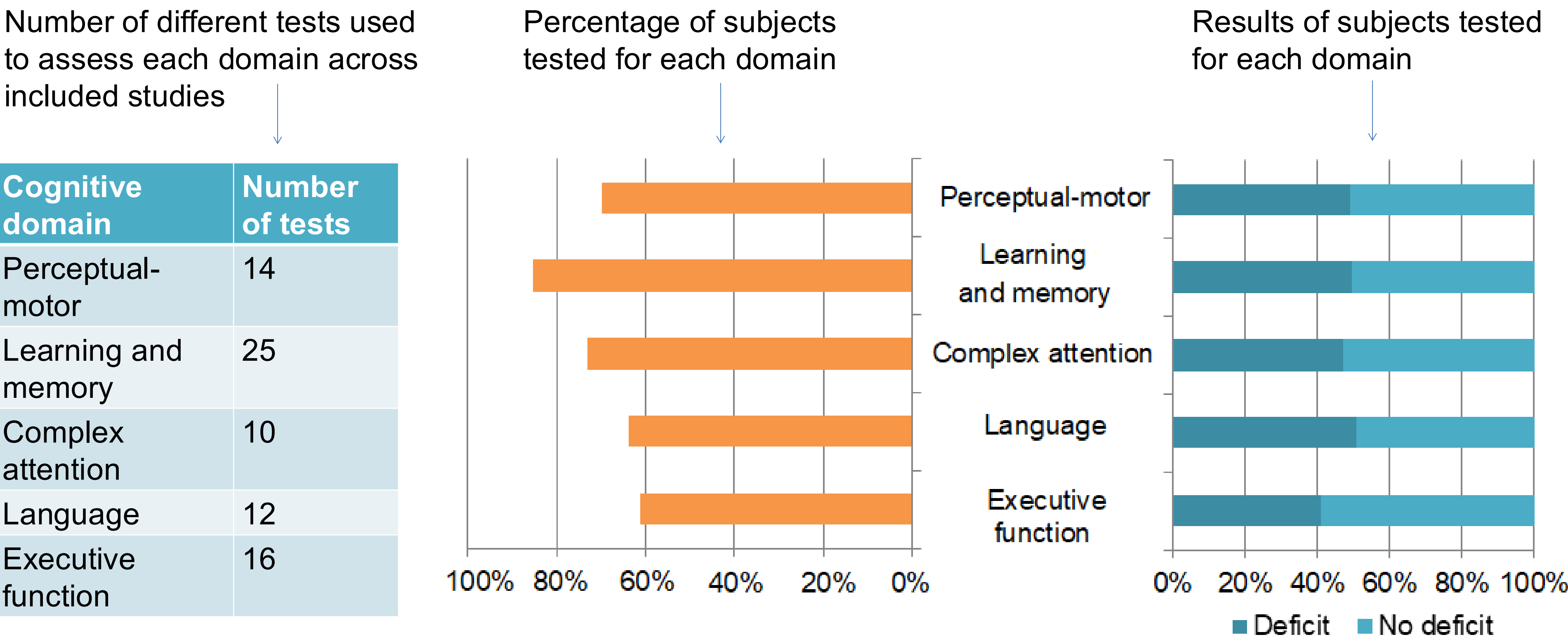


RESULTS

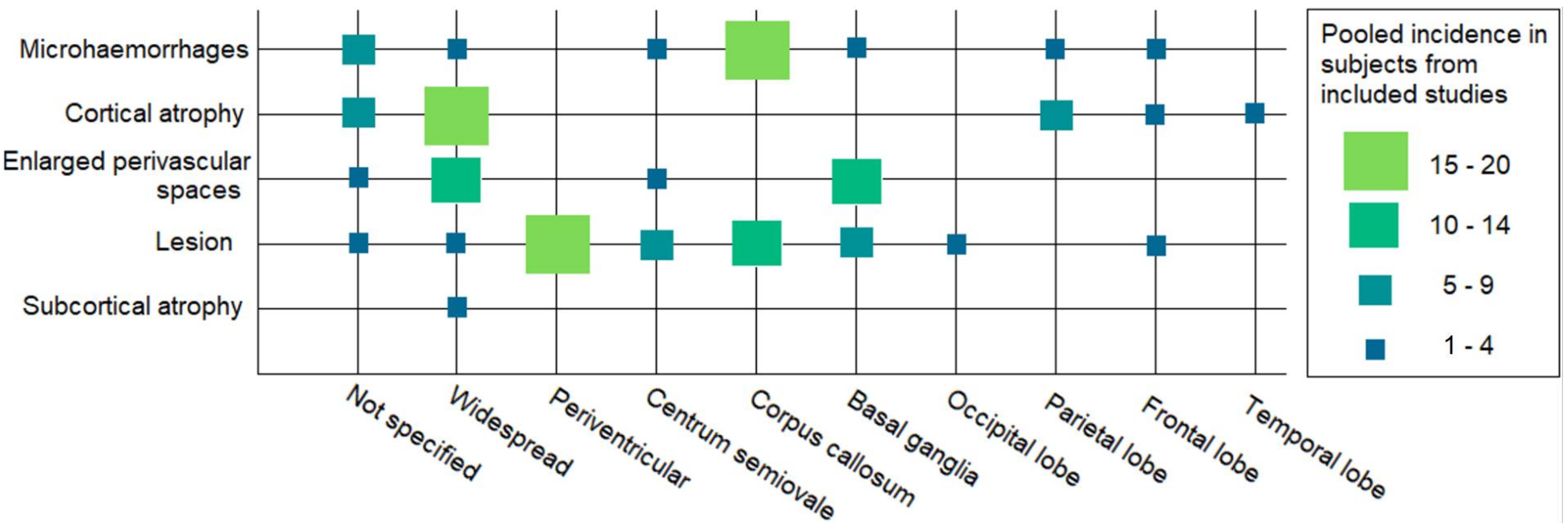
Characteristics of included studies and subjects



Neurocognitive testing



Type and location of abnormality on MRI brain imaging



LIMITATIONS

- <40% of studies assessed subjects ≥3 months after HA exposure, limiting conclusions about the chronicity of impairment.
- Lack of standardised neurocognitive testing challenges direct comparison of results.
- Neurocognitive tests are vulnerable to learning effects which can mask deficits.

CONCLUSIONS

- Brain MRI changes known to be associated with cognitive impairment can be detected after HA exposure³.
- Significant proportions of people exposed to HA have cognitive deficits that persist after RSL.
- Data regarding the reversibility of structural brain changes and cognitive impairment is lacking.
- Cognitive impairment is not clearly defined in the literature and there is a lack of standardisation regarding how it is assessed.

FUTURE STUDIES

- Large-scale longitudinal studies are needed to evaluate reversibility.
- Assessment methods require standardisation.
- Methods to mitigate for learning effects should be implemented.

REFERENCES

1. Kottke R, Hefti JP, Rummel C, Hauf M, Hefti U, Merz TM. Morphological brain changes after climbing to extreme altitudes - A prospective cohort study. PLoS One. 2015;10(10).
2. Arksey H, O'Malley L. Scoping studies: Towards a methodological framework. International Journal of Social Research Methodology: Theory and Practice. 2005;8(1).
3. Prins ND, Scheltens P. White matter hyperintensities, cognitive impairment and dementia: An update. Vol. 11, Nature Reviews Neurology. 2015.