Traumatic Brain Injury Classification with Multimodal Data Fusion: Insights from a Preliminary Systematic Review

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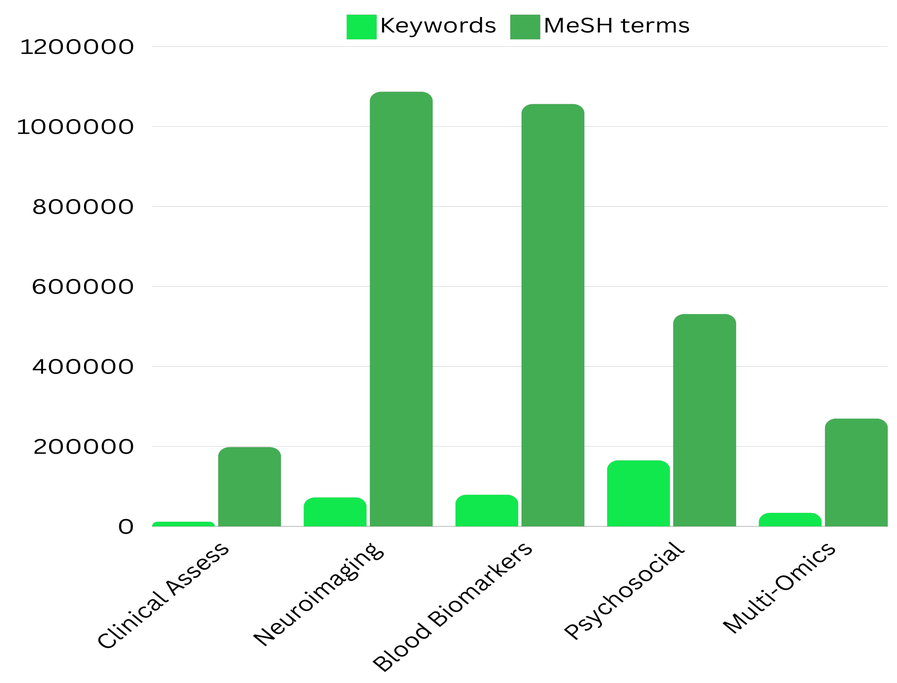
Introduction

- **Background:** TBI research spans diverse data domains—clinical assessments, neuroimaging, blood biomarkers, psychosocial factors, and multi-omics—requiring integrated approaches for a holistic understanding. **Despite significant advances, the integration of these domains remains limited, hindering a comprehensive understanding of TBI outcomes.**

Methods

- **Systematic Search**: Conducted across PubMed, PsycINFO, IEEE Xplore, Scopus, and Web of Science.
- **Search Terms**: Used combinations of terms related to TBI, clinical assessments, neuroimaging, biomarkers, psychosocial factors, and multi-omics.
- Clinical assessment was captured using broad terms like Glasgow Coma Scale and neurological evaluations, adjusting for terms not aligned with PubMed's phrase index
- **Screening Criteria**: Studies were screened for the integration of **at least three data domains.**

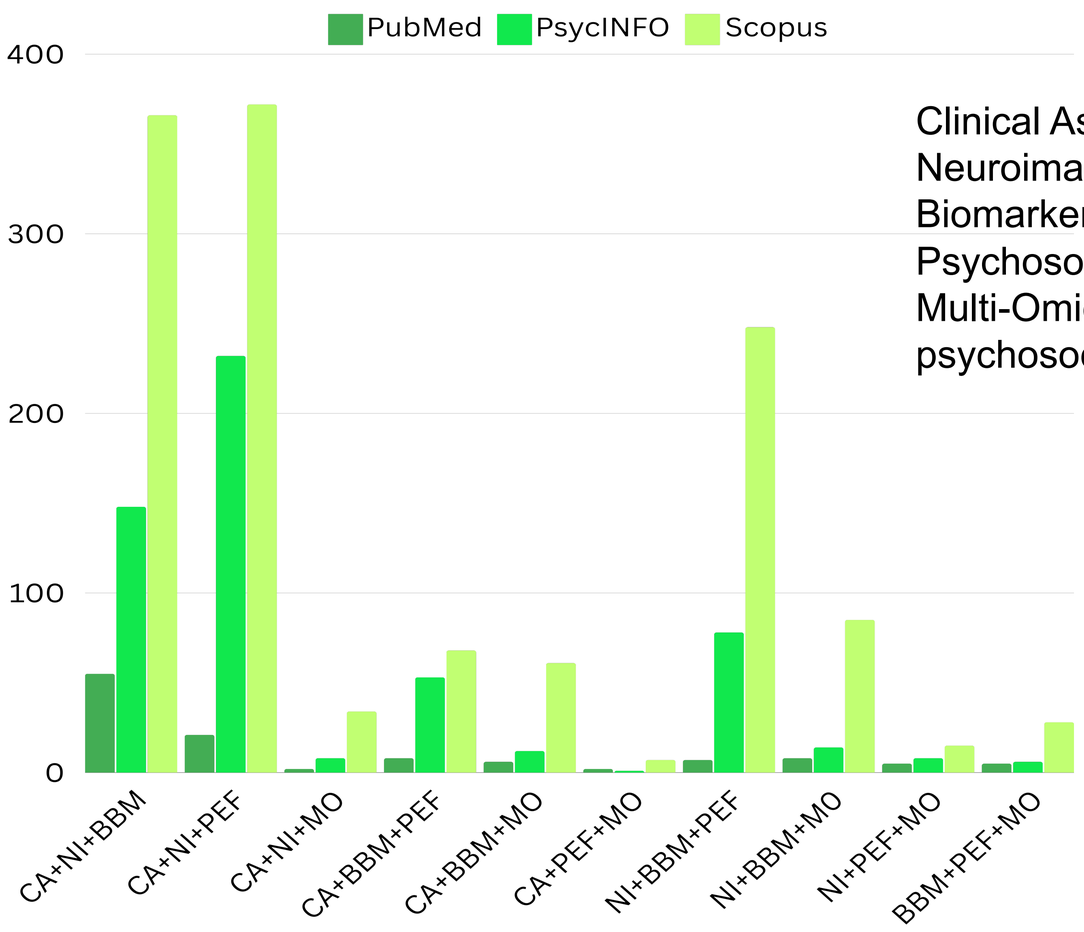
A systematic review was initiated to explore the extent of multimodal data integration in TBI research, identifying current trends and gaps.



Number of single-domain studies in PubMed, excluding the keyword or MeSH term 'TBI'

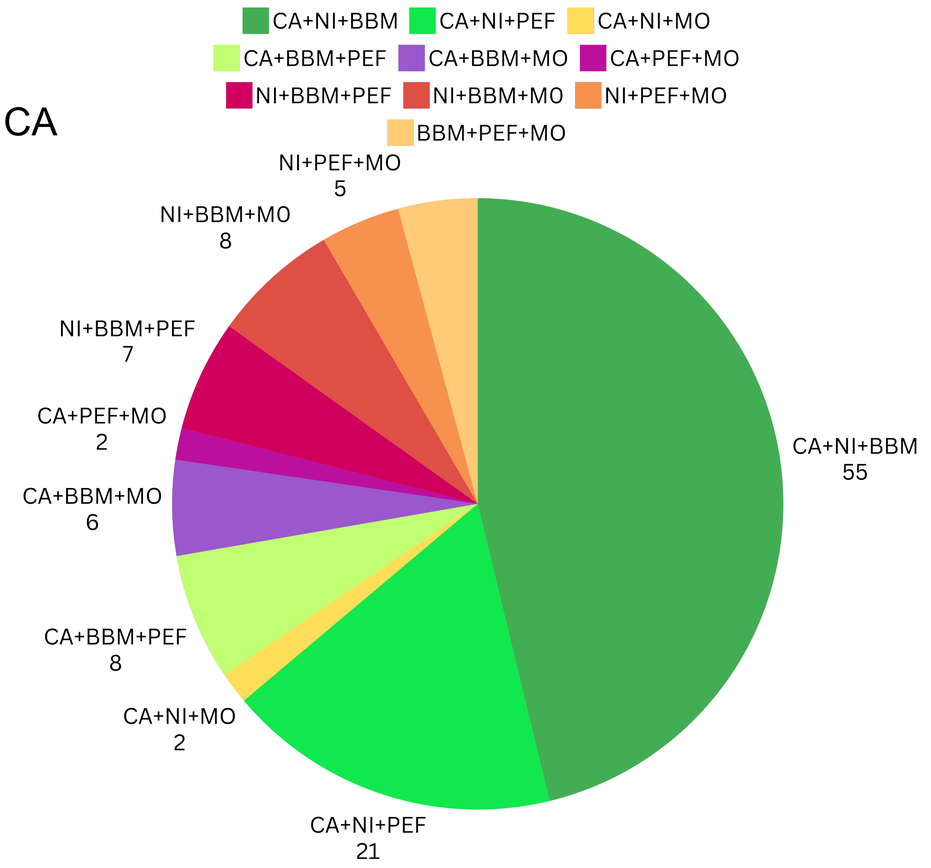
Results

Our preliminary analysis shows emerging trends in the integration of multimodal data within TBI research. There is a growing interest in combining Neuroimaging with Biomarkers, though the integration of Psychosocial Factors and Multi-Omics Data remains limited



Clinical Assessments → CA
Neuroimaging → NI
Biomarkers → BBM
Psychosocial → PS
Multi-Omics → MO
psychosocial→ PEF

Neuroimaging and blood biomarkers dominate TBI research <u>across databases</u>, while other combinations are underrepresented



<u>PubMed</u> data shows a strong focus on Neuroimaging and Biomarkers.

Conclusion

✓ **These preliminary findings reveal a critical gap in the comprehensive integration of multimodal data in TBI research.**