Impact of Cognitive Training on Dementia Prevention

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Background

With an ever-growing elderly population, the number of people with dementia is expected to triple by 2050 (Dementia, 2017). Dementia prevention is an increasingly critical issue that needs to be addressed. Mild cognitive impairment is considered an intermediate, subclinical stage between normal cognition and dementia. The most common subtype, amnestic MCI (a-MCI), is thought to be a strong predictor of future dementia (Tangalos and Petersen, 2018). It has been reported that individuals with a-MCI progress to dementia at a rate of 12-15% per year compared to 1-2% for healthy adults (Kinsella et al., 2009). A number of studies have implemented cognitive therapies for adults with MCI, but few have analyzed the long-term results of such therapies regarding cognitive decline. This prompted the authors to systematically review studies of cognitive intervention in adults with MCI and evaluate whether intervention prevents further cognitive decline into dementia.

Methods

Search Terms: ("mild cognitive impairment" OR "MCI" OR "pre-dementia) AND ("cognitive training" OR "cognitive stimulation" OR "cognitive intervention" OR "cognitive therapy" OR "cognitive treatment" OR "cognitive strategies")

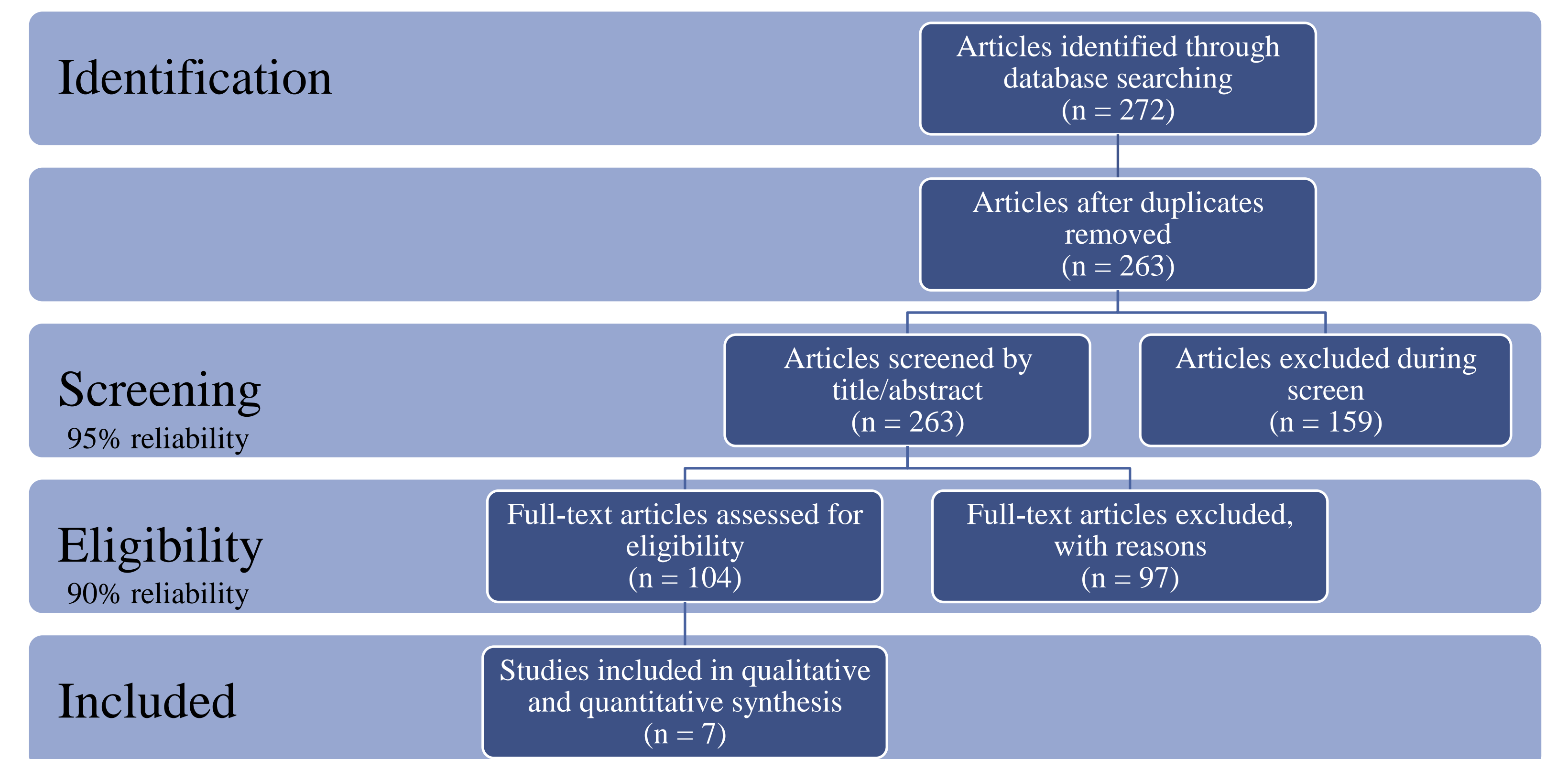| Inclusion Criteria	Exclusion Criteria
• Peer-reviewed studies • RCTs/CCTs • Longitudinal studies • Articles from the last ten years (2009-2019) • Studied cognitive training in adults with aMCI diagnosis	• Early-onset dementia diagnosis • Comorbidities known to impair cognition • Video game, virtual reality, or computer-based training • Studies that did not follow-up beyond immediate end of intervention to assess duration of outcomes

The authors searched CINAHL, PubMed, and PsycInfo. Titles and abstracts of each article from the initial search were screened for relevance with 30% of articles double-screened with blinding. A full-text review was conducted for the remaining articles to determine inclusion, with 29% of articles double-screened with blinding. Quality appraisals were then carried out using Cincinnati Children's LEGEND tools for all remaining articles by each reviewer. Inter-rater reliability was 90% or higher for each step of the review process.

Results

Study	n	Population Characteristics	Intervention	Follow-Up (months)	Significant Results
Kinsella et al. (2009) RCT Good quality	44	• Patients from two memory clinics in Melbourne, Australia • Mean age: 76.8 • aMCI	• 5 weeks • Prospective memory strategies • Attention strategies • Memory strategies for everyday functioning • Family participation	4	• Improvement in prospective memory performance (Cohen's d = .29) • Improvement in reported knowledge and use of memory strategies (Cohen's d = .27)
Buschert et al. (2012) RCT Good quality	18	• Patients at the Alzheimer's Memorial Center in Munich, Germany • Mean age: n/a • aMCI	• 6 months • Memory strategies • Informal cognitive and social stimulation • Early and delayed intervention groups	28	• Early intervention group showed improvement in cognition and immediate memory • Note: 50% of delayed intervention group converted to AD
Moro et al. (2012) CCT Good quality	30	• Patients at the University Hospital of Verona Center for Alzheimer's and Cognitive Diseases in Verona, Italy • Mean age: 70.9 • aMCI	• 6 months • Memory strategies • Metacognitive abilities • Caregiver training • Early and delayed intervention groups	6	• Early intervention group experienced benefits at follow-up • Delayed intervention group declined during period without training • Both groups improved after receiving intervention, but early intervention was more beneficial
Rojas et al. (2013) RCT Good quality	30	• Patients in the memory unit of the Hospital General Abel Zubizarreta in Buenos Aires, Argentina • Mean age: 74.47 • aMCI	• 6 months • Informal cognitive stimulation • Formal cognitive training • Education about MCI	6	• Non-trained group declined in cognition, memory recognition, and semantic fluency • Intervention group showed improvement on naming and semantic fluency • Note: 1 intervention and 3 non-trained participants progressed to dementia
Vidovich et al. (2015) RCT Lesser quality	127	• Australia residents • Proficient in written and spoken English • Mean age: 75 • aMCI*	• 5 weeks • Memory, attention, executive function tasks • Application to everyday life	24	• Other than improved performance on forward digit span tasks, no significant results were reported for cognition
Jeong et al. (2016) RCT Good quality	197	• Patients in South Korea across 18 neurology clinics • Mean age: 70.3 • aMCI	• 3 months • Memory, attention, executive function, visuospatial tasks • Compensatory strategies • Home-based and group-based interventions	6	• Both intervention groups showed cognitive improvements • Group-based intervention showed improvement in prospective memory • Home-based intervention showed improvement on Clinical Dementia Rating Scale
Belleville et al. (2018) RCT Good quality	104	• Participants from memory clinics in Montreal, Quebec City • Mean age: 72.2 years • aMCI	• 8 weeks • Memory and attention control strategies • Education on memory, health, aging	6	• Increase in delayed memory score • Increase in memory strategy use in daily life

Assessments Used: Alzheimer's Disease Assessment Scale, Auditory Verbal Learning Test, Cambridge Cognitive Examination-Revised, Clinical Dementia Rating Scale, Listening Span Test, Multifactorial Memory Questionnaire, Mini-Mental State Examination, Prospective Memory Test, Repeatable Battery for the Assessment of Neuropsychological Status, Story Recall, Stroop Test, Verbal Fluency

*All studies except for Vidovich, et al. (2015) diagnosed aMCI using Peterson's Criteria: 1. Memory impairment described by the patient, relatives, or both. 2. Cognitive impairment objectified by means of a neuropsychological test battery. 3. No impairment of activities in day-to-day life. 4. Absence of dementia as defined by the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition (DSM-IV)

Identification — Articles identified through database searching (n = 272)

Articles after duplicates removed (n = 263)

Screening 95% reliability — Articles screened by title/abstract (n = 263) | Articles excluded during screen (n = 159)

Eligibility 90% reliability — Full-text articles assessed for eligibility (n = 104) | Full-text articles excluded, with reasons (n = 97)

Included — Studies included in qualitative and quantitative synthesis (n = 7)

Discussion

Cognitive training improved cognitive performance for ranging periods of time (4-28 months) following intervention in six of seven studies. Longer interventions reaped more significant results, and earlier intervention pointed to longer-lasting significant cognitive improvements. The reviewed studies looked at multi-component interventions. Until further research looks at the efficacy of specific intervention techniques, multi-component cognitive intervention is recommended. Although there were significant outcomes, it should be noted that many outcome measures yielded non-significant results. Also, only one study (Kinsella et al., 2009) reported effect size. Replications of the studies with larger sample sizes are needed to obtain stronger evidence. A limitation of this review was the exclusion of computer-based cognitive interventions, but the authors were specifically interested in interventions more directly related to services that speech-language pathologists provide. While these studies did not determine if dementia can be prevented through cognitive intervention, they did show that early and longer-term intervention for mildly impaired individuals may capitalize on remaining cognitive reserve to improve cognition over time and/or delay progression to dementia.

Disclosures/Acknowledgements/References