# Longitudinal Evaluation of Cognition After Stroke – A Scoping Review


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# STROKE BY THE NUMBERS

Every **40 seconds** someone has a stroke

55,000

About 55,000 more women than men have a stroke each year

**1 in 4**

strokes are in people who have had a previous stroke

**#5** **Cause of death in the USA**

## 80% OF ALL STROKES CAN BE PREVENTED

American Heart Association | American Stroke Association

life is why™

*Together* to End Stroke™

# Cognitive impairment after stroke

- Affects up to 85% of stroke survivors (Wall et al. 2015);
- Persist over time, but hard to detect (Ghosal, 2014; Douiri, 2014; van Heugten)

## Research questions

1. What instruments do clinicians use to evaluate cognition over time?
2. What is the longitudinal trajectory of cognition after stroke?

# Scoping review

"When a body of literature has not yet been comprehensively reviewed, or is not amenable to a more precise systematic review."

(Peters et al, 2015, p.141)

## Inclusion

1. Intervention and observational studies
2. Between 2001-2017
3. English
4. Report cognition over time

## Exclusion

1. Animal studies
2. Children and adolescent stroke
3. SAH and TIA

# Search strategy

CINAHL, Pubmed, Psycinfo, Medline, Web of Knowledge, and Embase

- MH **stroke**+ OR TI "cerebrovascular accident" OR TI "cerebro vascular accident" OR TI "cerebral vascular accident" OR TI "brain ischaemic attack" OR TI "brain ischemic attack" OR TI "brain vascular accident" OR TI CVA OR TI "ischaemic cerebral attack" OR TI "ischemic cerebral attack" OR AB "cerebrovascular accident" OR AB "cerebro vascular accident" OR AB "cerebral vascular accident" OR AB "brain ischaemic attack" OR AB "brain ischemic attack" OR AB "brain vascular accident" OR AB CVA OR AB "ischaemic cerebral attack" OR AB "ischemic cerebral attack" AND MH **cognition**+ OR TI cognit* OR TI "cognitive accessibility" OR TI "cognitive balance" OR TI "cognitive dissonance" OR TI "cognitive function" OR TI "cognitive structure" OR TI "cognitive symptoms" OR TI "cognitive task" OR TI "cognitive thinking" OR TI "neurobehavioral manifestations" OR TI "neurobehavioural manifestations" OR TI volition MH "executive function"+ OR TI "executive function" OR TI "executive functions" OR TI "executive control" OR TI "executive controls" OR AB cognit* OR AB "cognitive accessibility" OR AB "cognitive balance" OR AB "cognitive dissonance" OR AB "cognitive function" OR AB "cognitive structure" OR AB "cognitive symptoms" OR AB "cognitive task" OR AB "cognitive thinking" OR AB "neurobehavioral manifestations" OR AB "neurobehavioural manifestations" OR AB volition OR AB "executive function" OR AB "executive functions" OR AB "executive control" OR AB "executive controls" AND MH "longitudinal studies"+ OR TI "**longitudinal study**" OR TI "longitudinal studies" OR TI "longitudinal evaluation" OR TI "longitudinal survey" OR TI "prospective study" OR AB "longitudinal study" OR AB "longitudinal studies" OR AB "longitudinal evaluation" OR AB "longitudinal survey" OR AB "prospective study" OR MH "follow-up studies"+ OR TI "follow up study" OR AB "follow up study" OR TI "followup study" OR AB "followup study" OR TI "follow* up" OR AB "follow* up" AND MH "outcome assessment" OR TI "outcome assessment*" OR AB "outcome assessment*" OR MH "treatment outcomes+" OR TI "treatment outcome*" OR AB "treatment outcome*" OR MH "patient-reported outcomes+" OR TI "patient-reported outcome*" OR AB "patient-reported outcome*" OR TI outcome* OR TI measure* OR TI asses* OR TI eval* OR AB **outcome*** OR AB measure* OR AB asses* OR AB eval*AND **English** AND academic journals

# Results

Found = 4,630
Duplicates = 1,743

Screened = 2,883

Full text (included)= 496 (17%)

Full text (conflicts) = 204 (7%)

= 700

## Summary of findings (n=143 studies)

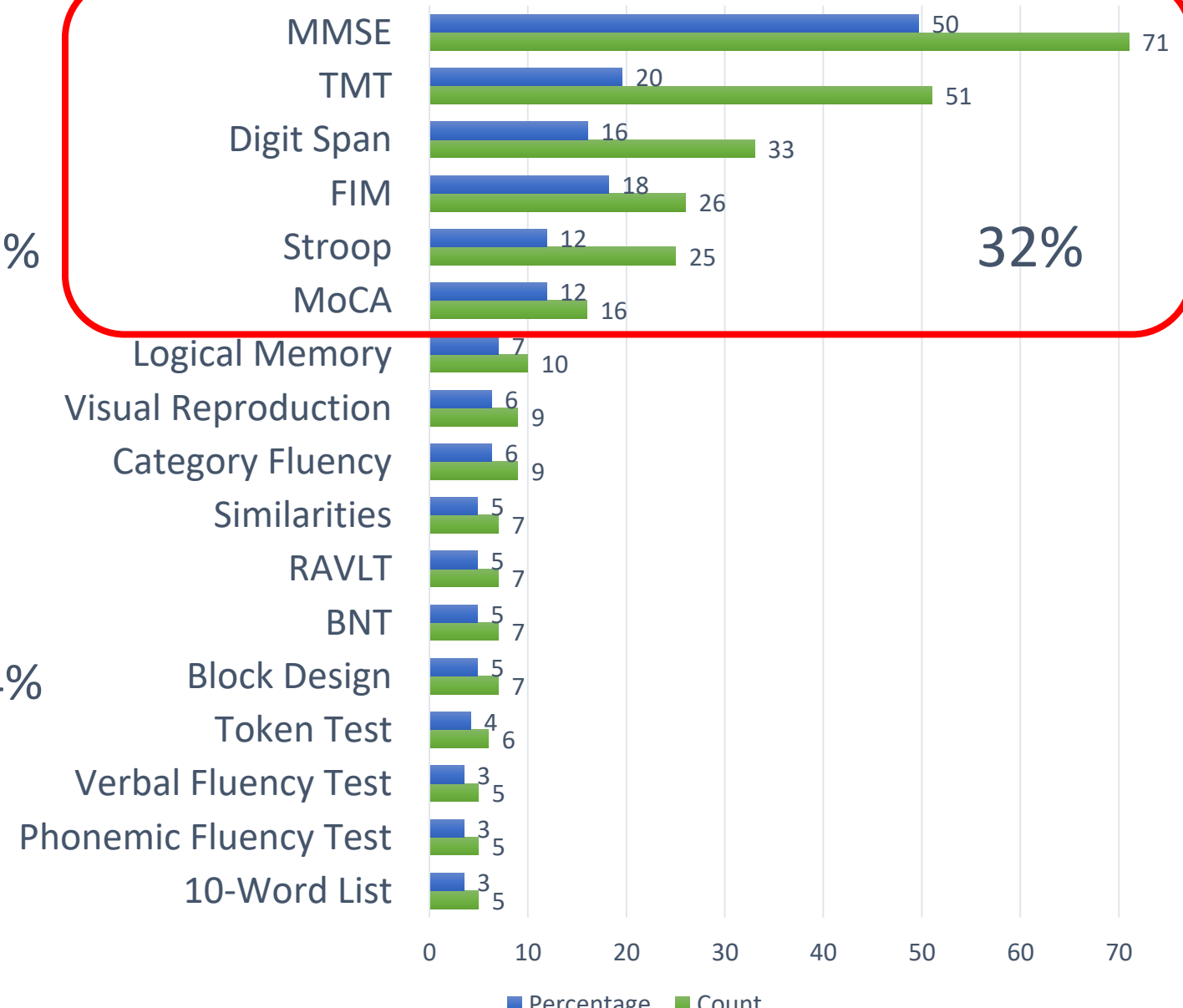
| | Count | Percentage |
|---|---|---|
| **Study Type** | | |
| Intervention | 46 | 32.2 |
| Observational | 98 | 68.5 |
| **Sample Size (Range 8 to 20,332)** | | |
| <25 | 14 | 9.8 |
| 25-49 | 23 | 16.1 |
| 50-99 | 35 | 24.5 |
| 100-149 | 24 | 16.8 |
| 150-499 | 32 | 22.4 |
| 500-1499 | 6 | 4.2 |
| 1500-3999 | 5 | 3.5 |
| >4000 | 4 | 2.8 |
| **Furthest follow-up point (range 1 week to 15 years)** | | |
| ≤ 1 mo | 8 | 5.6 |
| > 1 and ≤ 3 mo | 26 | 18.2 |
| > 3 and ≤ 6 mo | 24 | 16.8 |
| > 6 and ≤ 12 mo | 34 | 23.8 |
| > 12 and ≤ 24 mo | 25 | 17.5 |
| > 24 and ≤ 36 mo | 11 | 7.7 |
| > 36 and ≤ 60 mo | 9 | 6.3 |
| > 60 mo | 6 | 4.2 |

67%

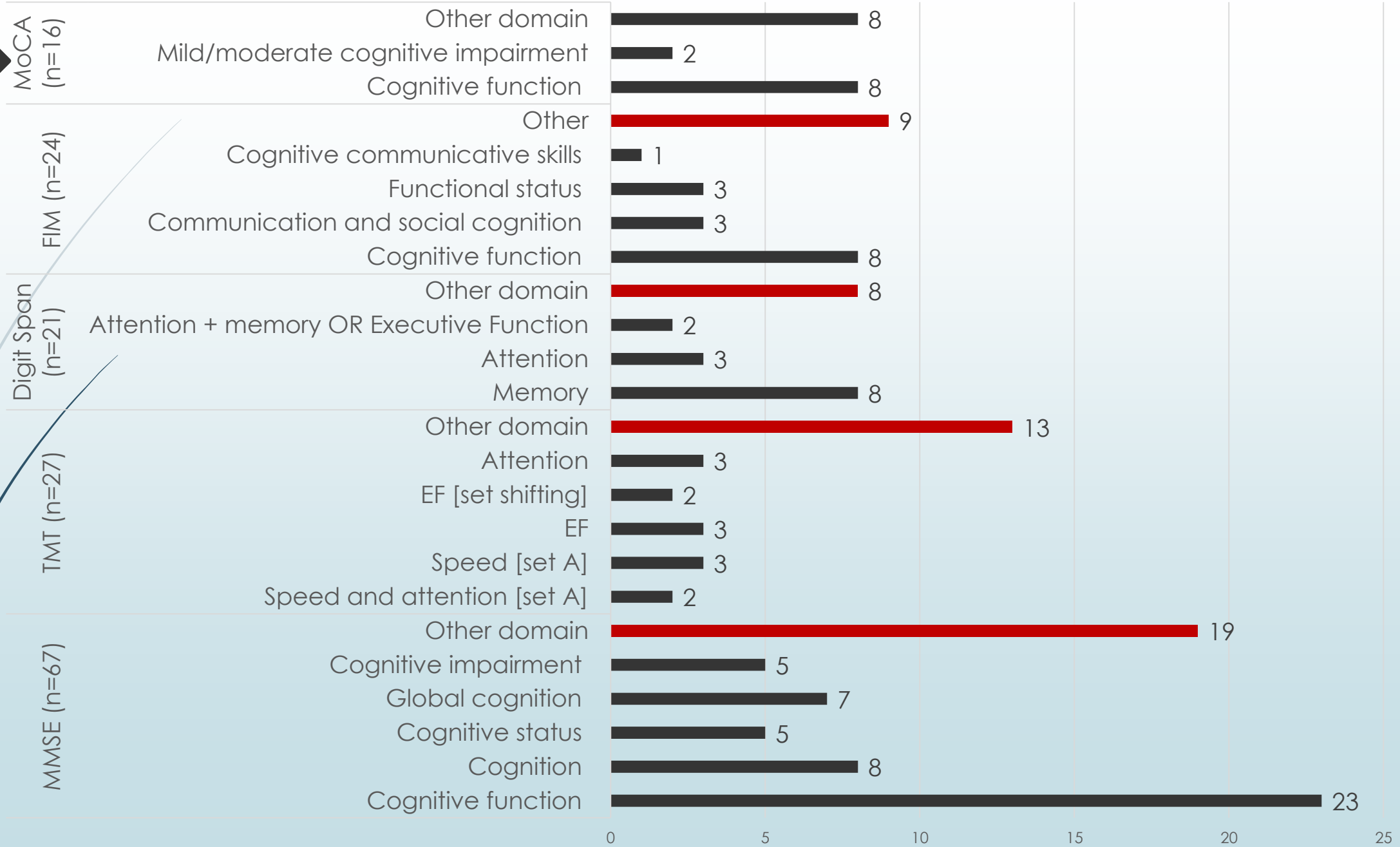
64%

## Unique assessments (n = 265)

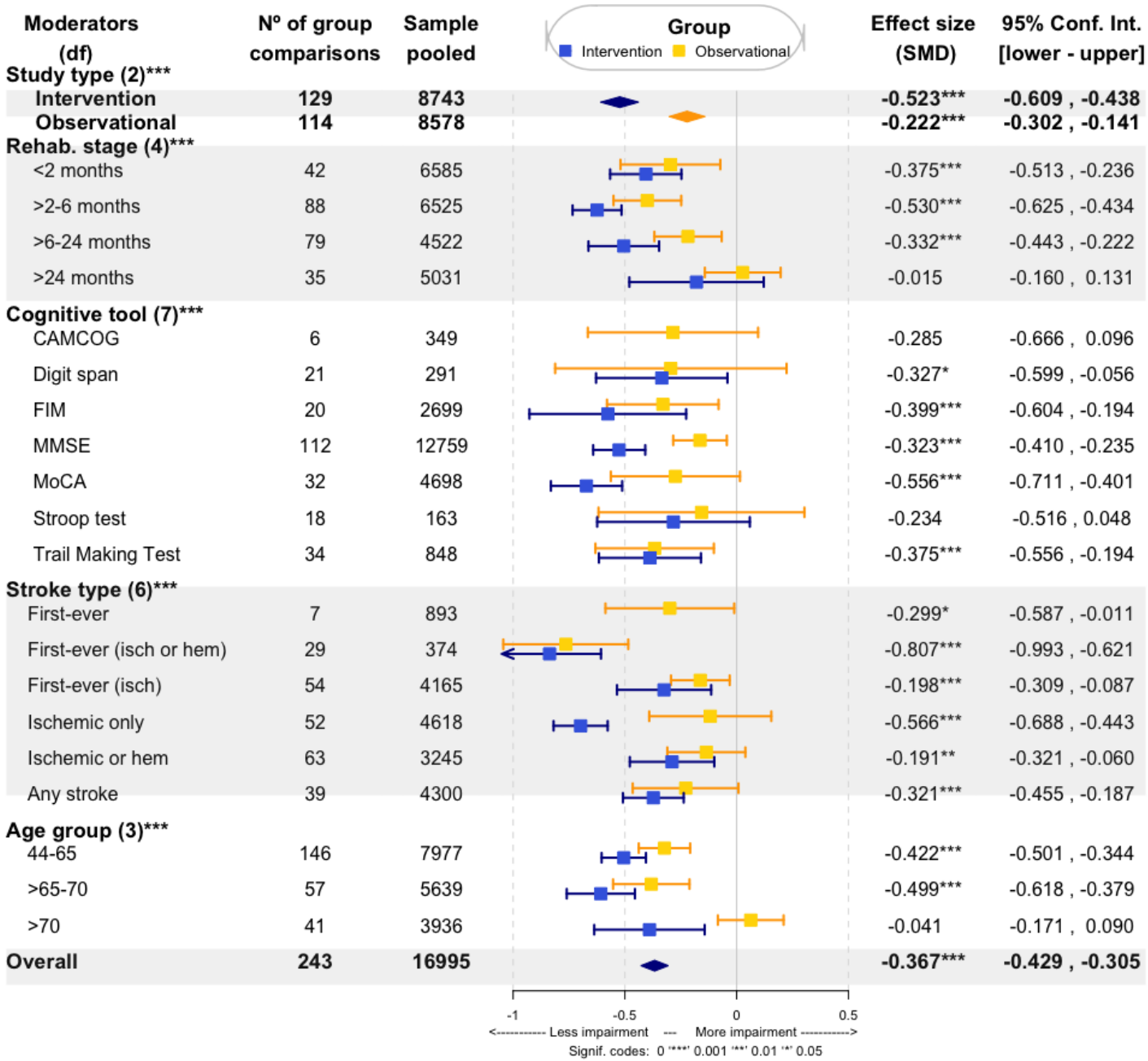
### 17 instruments charted = 45%



# Unique Domains (n=109)



## Figure 2: Forest Plot of Cognition After Stroke (mixed-effects model)




| Moderators (df) | Nº of group comparisons | Sample pooled | Effect size (SMD) | 95% Conf. Int. [lower - upper] |
|---|---|---|---|---|
| **Study type (2)*** ** | | | | |
| **Intervention** | **129** | **8743** | **-0.523*** ** | **-0.609 , -0.438** |
| **Observational** | **114** | **8578** | **-0.222*** ** | **-0.302 , -0.141** |
| **Rehab. stage (4)*** ** | | | | |
| <2 months | 42 | 6585 | -0.375*** | -0.513 , -0.236 |
| >2-6 months | 88 | 6525 | -0.530*** | -0.625 , -0.434 |
| >6-24 months | 79 | 4522 | -0.332*** | -0.443 , -0.222 |
| >24 months | 35 | 5031 | -0.015 | -0.160 , 0.131 |
| **Cognitive tool (7)*** ** | | | | |
| CAMCOG | 6 | 349 | -0.285 | -0.666 , 0.096 |
| Digit span | 21 | 291 | -0.327* | -0.599 , -0.056 |
| FIM | 20 | 2699 | -0.399*** | -0.604 , -0.194 |
| MMSE | 112 | 12759 | -0.323*** | -0.410 , -0.235 |
| MoCA | 32 | 4698 | -0.556*** | -0.711 , -0.401 |
| Stroop test | 18 | 163 | -0.234 | -0.516 , 0.048 |
| Trail Making Test | 34 | 848 | -0.375*** | -0.556 , -0.194 |
| **Stroke type (6)*** ** | | | | |
| First-ever | 7 | 893 | -0.299* | -0.587 , -0.011 |
| First-ever (isch or hem) | 29 | 374 | -0.807*** | -0.993 , -0.621 |
| First-ever (isch) | 54 | 4165 | -0.198*** | -0.309 , -0.087 |
| Ischemic only | 52 | 4618 | -0.566*** | -0.688 , -0.443 |
| Ischemic or hem | 63 | 3245 | -0.191** | -0.321 , -0.060 |
| Any stroke | 39 | 4300 | -0.321*** | -0.455 , -0.187 |
| **Age group (3)*** ** | | | | |
| 44-65 | 146 | 7977 | -0.422*** | -0.501 , -0.344 |
| >65-70 | 57 | 5639 | -0.499*** | -0.618 , -0.379 |
| >70 | 41 | 3936 | -0.041 | -0.171 , 0.090 |
| **Overall** | **243** | **16995** | **-0.367*** ** | **-0.429 , -0.305** |

# Conclusion

- Most studies do not evaluate cognition past the 1 year mark
- The MMSE is [by far] the mostly widely used cognitive assessment
- Cognitive domains are not reported consistently and need to be organized more comprehensively
- Cognitive function can be described quantitatively with appropriate meta-analytic methods.

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