The Scoping Review of **Allen Cognitive Level Screening (ACLS)** and Its Relationship with **Other Cognitive Assessment**

WFOT Congress

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Declaration

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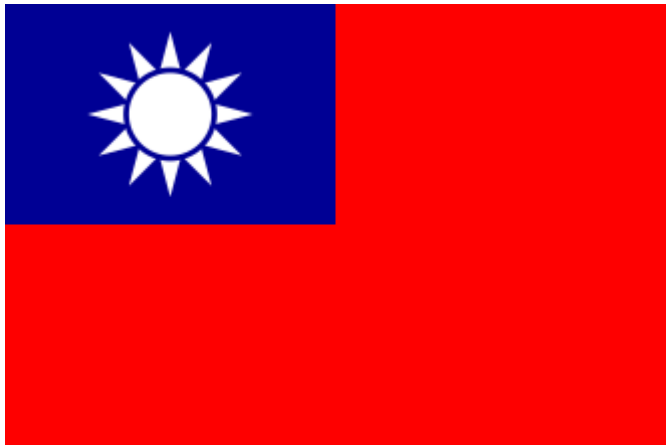
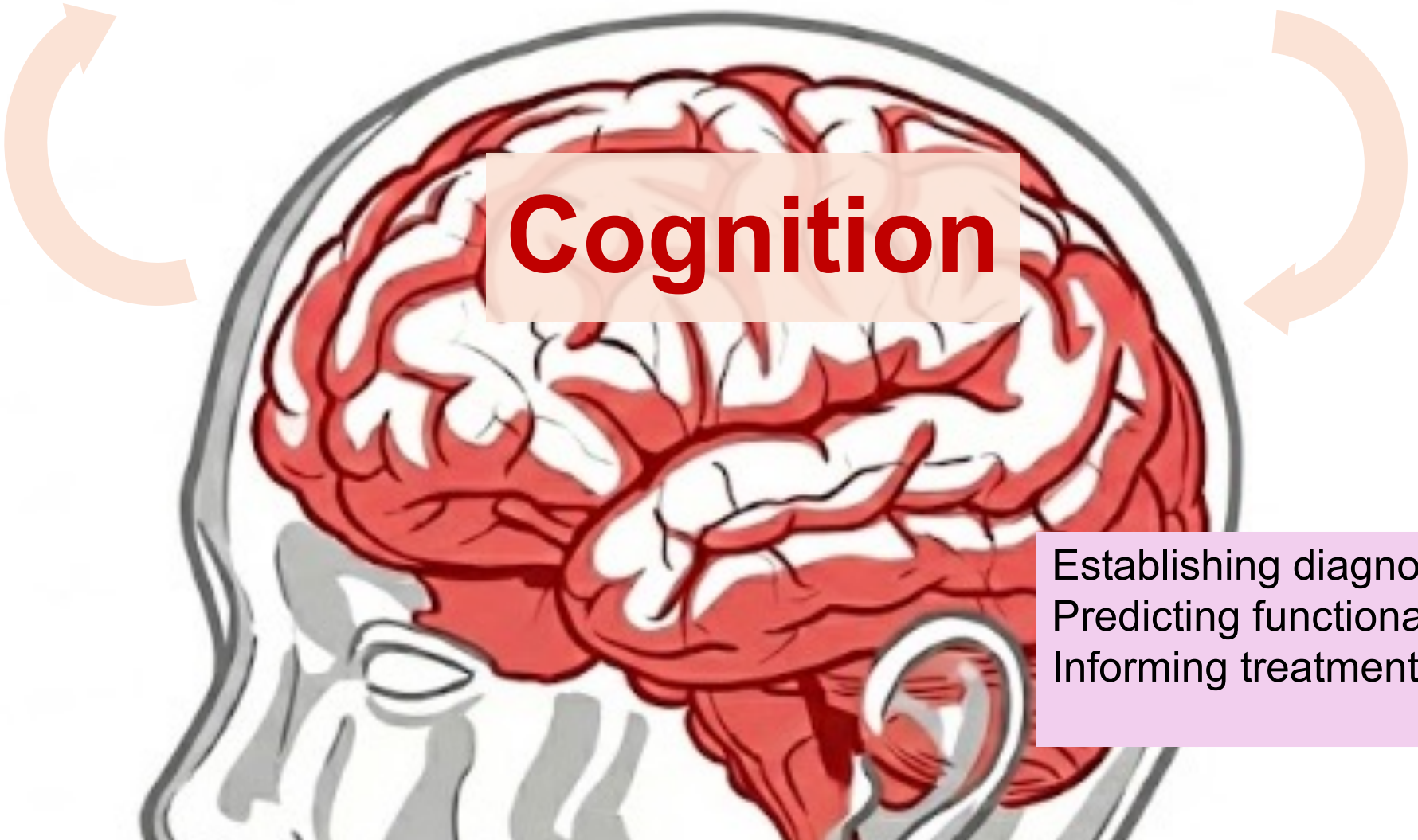


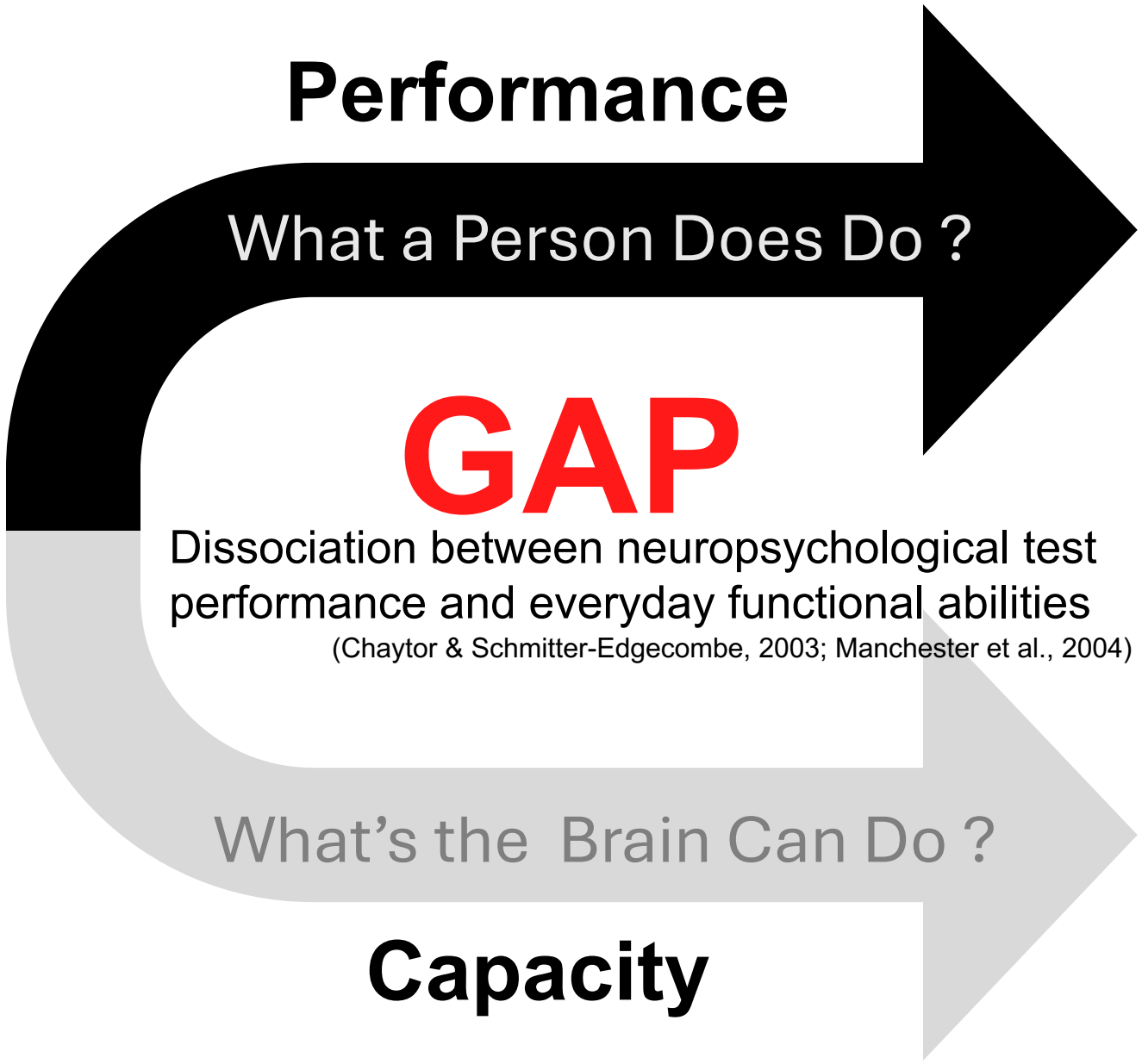
Mental processes through which individuals acquire, process, store, and utilize information to inform and guide their behavior (Lezak et al., 2012)

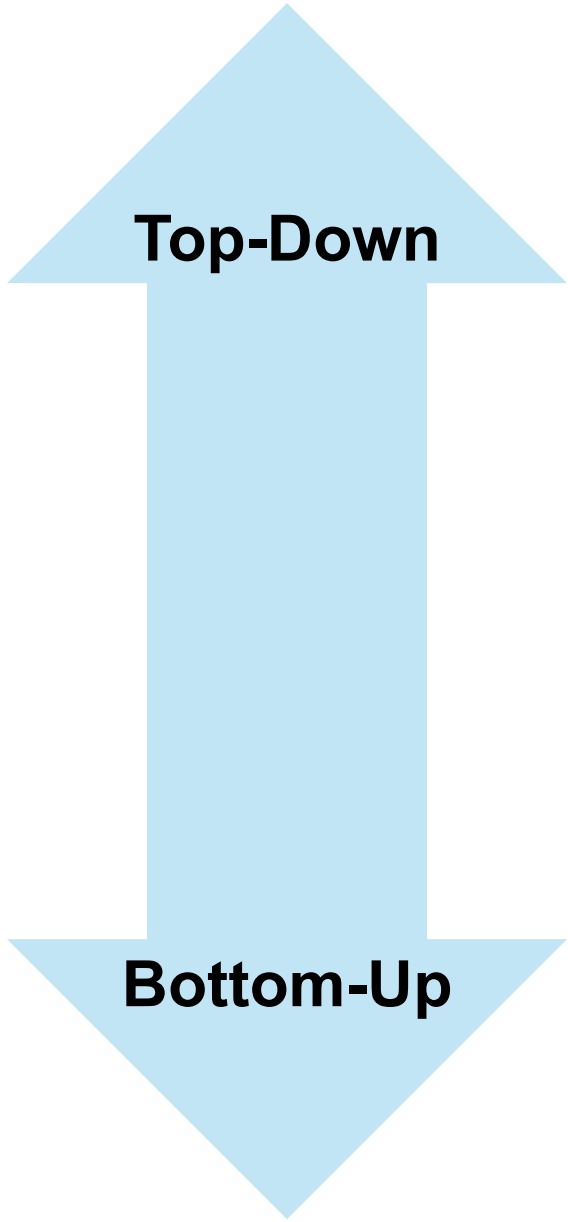


Cognition

Establishing diagnosis
Predicting functional outcomes
Informing treatment planning
(Harvey, 2012)

Clinical Population	Primary Cognitive Impairments
Schizophrenia spectrum disorders	Executive dysfunction, working memory impairments (Joshi et al., 2021)
Dementia	Progressive memory and visuospatial deterioration (Cipriani et al., 2020)
Substance use disorders	Compromised executive control (Verdejo-Garcia et al., 2019)
Cerebrovascular accidents	Domain-specific functions affected in ~80% of survivors (Stolwyk et al., 2024)


Performance
What a Person Does Do ?
GAP
Dissociation between neuropsychological test performance and everyday functional abilities
(Chaytor & Schmitter-Edgecombe, 2003; Manchester et al., 2004)
What's the Brain Can Do ?
Capacity


Top-Down
Bottom-Up

Allen Cognitive Disability Model

~ Late 1960

Allen Cognitive Disability Model

Allen Cognitive Level (ACL)

- ACL scores range hierarchically from Level 1 to Level 6, with decimal subdivisions providing refined measurement. Each level represents a qualitatively distinct pattern of attention to sensorimotor information (Allen, 2018; Earhart et al., 2022):

What's Construct of ACLS ?

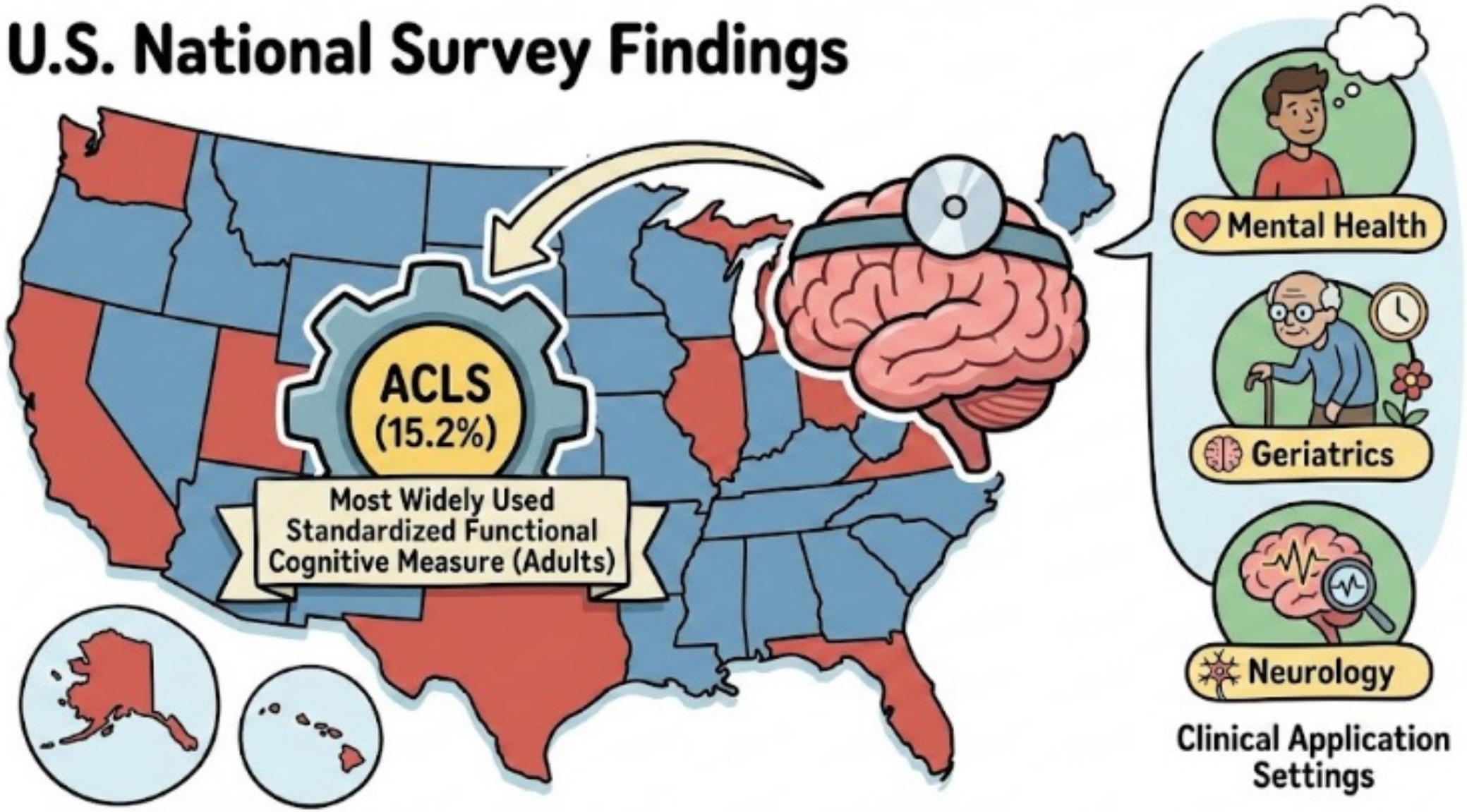
how's *the **leather-lacing** performance can be **related to broader task competence ?*** (Allen et al., 1985)

The instrument's purpose evolved to assess "***an individual's current capacity to learn other visuomotor tasks***" (Allen et al., 1992, p.32).

It measure "***best ability to function***" (Allen, 2003, p.2)

Since 2007, "***functional cognition***" has emerged as its primary construct (Allen et al., 2007; Earhart, 2022).

The ACLS-6 further posits that "*Allen Cognitive Level is **a categorization of the quality of information processing and global functional ability***" (Allen, 2018).



(Boone et al., 2025)

- Stewart et al (2022) found ACLS scores correlate strongly with functional capacity (89% of tasks) but less consistently with real-world adaptive performance (64% of activities), suggesting the assessment may better capture cognitive potential than typical everyday functioning.

Research Question

- What cognitive processes can be measured when ACLS is conceptualized as a cognitive assessment?
- Do ACLS activities related to what individuals “can do” in cognitive measurement?

Method

Identifying the Research Question

- What is known from published, peer-reviewed literature about relationships between scores on the ACLS and performance on measures of cognitive function across different populations?

Identifying Relevant Studies

PubMed Embase® CINAHL PsycINFO® WEB OF SCIENCE

5 Databases

AND

Bibliography

AND

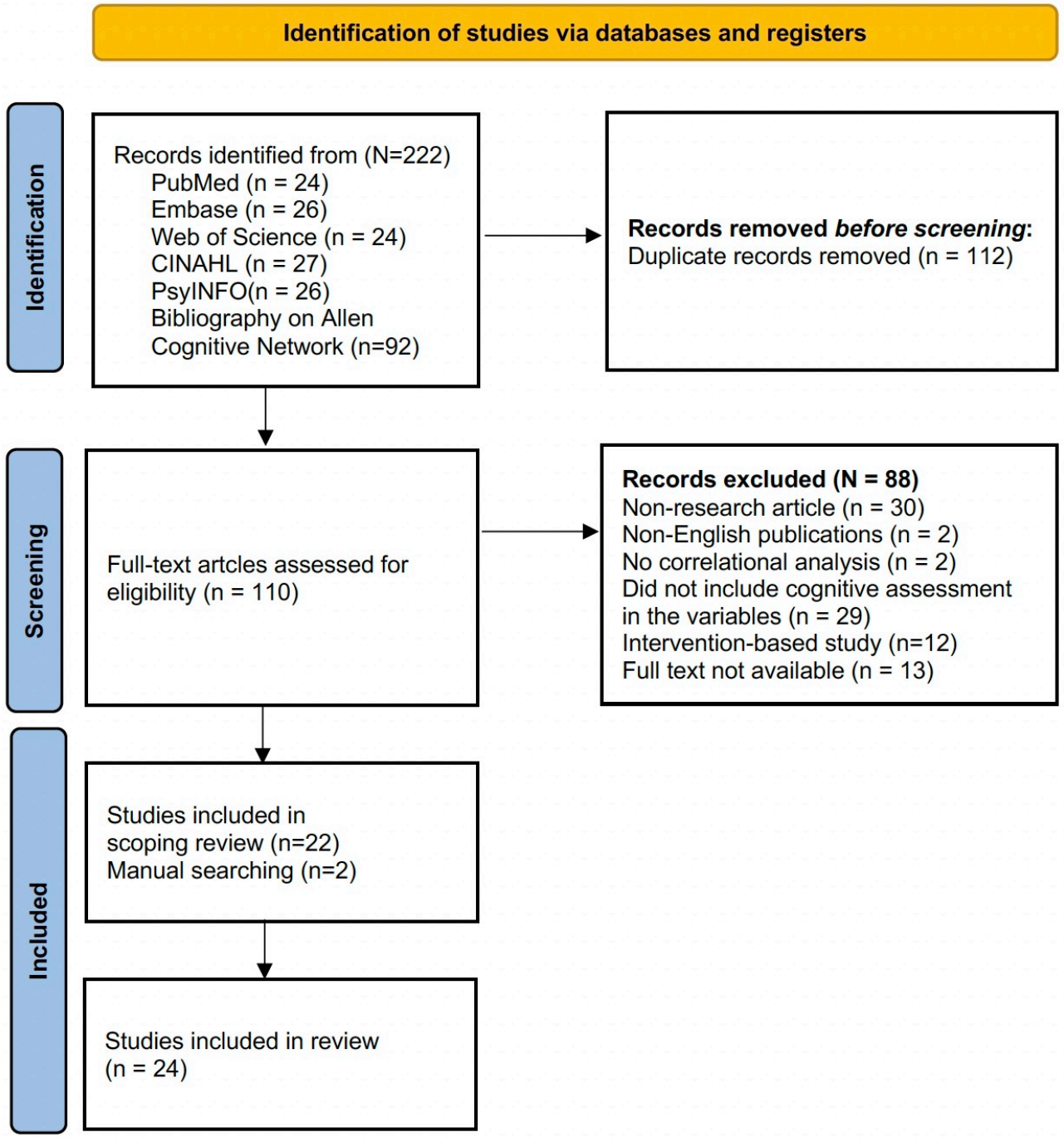
Manual Search

Keyword

("Allen Cogn*") AND (validity OR psychometric* OR neuropsych* OR "cognitive domain*" OR "cognitive function*")

Study Selection

- Two reviewers (G.-H. Liu and T.-Z Pan) independently screened titles and abstracts, without time limit until Jan. 2025
- Inclusion and Exclusion Criteria
    - (a) be published in peer-reviewed journals in English,
    - (b) include participants from clinical populations
    - (c) report empirical data using any ACLS version
    - (d) include at least one standardized cognitive measure
    - (e) report statistical analyses examining ACLS-cognitive measure relationships.
    - Studies focusing solely on functional outcomes without cognitive correlates were excluded.


Identification of studies via databases and registers
Identification
Records identified from (N=222)
PubMed (n = 24)
Embase (n = 26)
Web of Science (n = 24)
CINAHL (n = 27)
PsyINFO(n = 26)
Bibliography on Allen Cognitive Network (n=92)
Records removed *before screening*:
Duplicate records removed (n = 112)
Screening
Full-text artcles assessed for eligibility (n = 110)
Records excluded (N = 88)
Non-research article (n = 30)
Non-English publications (n = 2)
No correlational analysis (n = 2)
Did not include cognitive assessment in the variables (n = 29)
Intervention-based study (n=12)
Full text not available (n = 13)
Included
Studies included in scoping review (n=22)
Manual searching (n=2)
Studies included in review (n = 24)

Cognitive Domain	Measures
Global cognition	MMSE, MoCA, IQ, LOTCA Total Score
Executive function	WCST, TMT-B, Verbal fluency
Attention/processing speed/working memory	SDMT, CPT, Digit span
Memory/learning	HVLT, RAVLT, Logical Memory
Verbal and language	Verbal IQ, Vocabulary tests, BNT
Visuospatial/perceptual	Picture Arrangement, HVOT, LOTCA Visual Perception
Visual-motor constructional/psychomotor	Block Design, VMI, Finger Tapping
Social cognition	SIT, PVRS, CIIT, SBST
Functional cognition	AMPS, EFPT, ADM

Based on established neuropsychological frameworks (Lezak et al., 2012) and functional cognition concepts (Giles et al., 2020)

Cohen's (1988)

Correlation Strength	r Value Range
Weak	$r < 0.30$
Moderate	$0.30 \leq r < 0.50$
Strong	$r \geq 0.50$

Result

Overall Characteristic

- 24 studies, published between 1988 and 2023
- These studies encompassed a total of 1,951 participants across six diagnostic groups.
- Research was conducted in eight countries
  - United States (n = 7)
  - Spain (n = 4)
  - Israel (n = 3)
  - Taiwan (n = 3)
  - South Korea (n = 2)
  - Australia (n = 1),
  - Hong Kong (n = 1)
  - Turkey (n = 1).
- Sample sizes ranged from 24 to 232 participants.

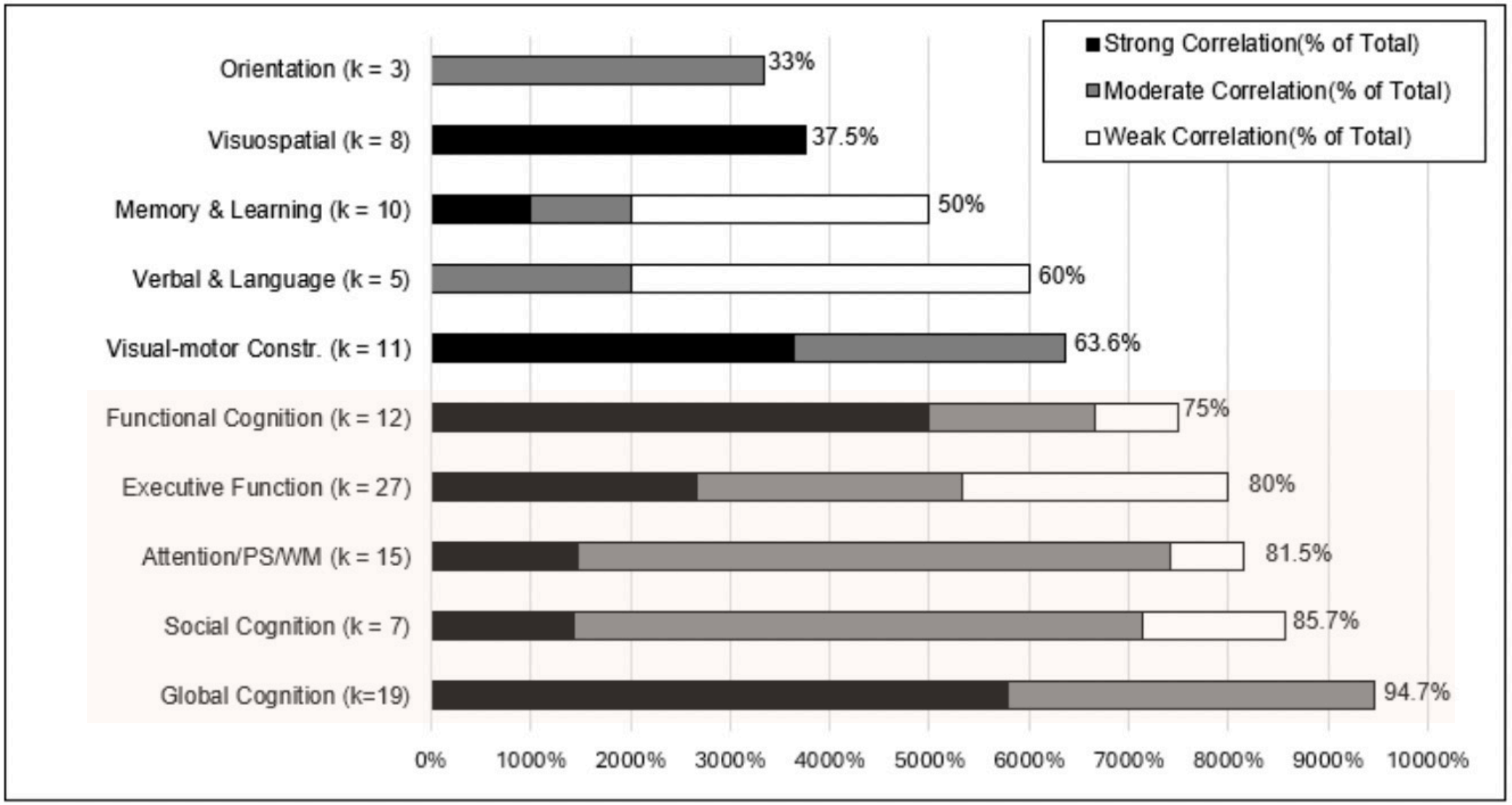
Diagnostic Group Distribution

- Outpatient psychotic spectrum (7 studies including 635 participants).
- Inpatient psychotic spectrum disorders (5 studies, 420 participants)
- Elderly/neurocognitive disorders (4 studies, 372 participants)
- Substance use disorders (3 studies, 332 participants)
- Neurological disorders (4 studies, 168 participants)
- Youth (1 study, 24 emotionally disturbed boys).

Version Utilization Across Studies

- ACLS-3 (n = 10, 41.7%)
- ACLS-5 (n = 10, 41.7%)
- ACLS-2 (n = 3, 12.5%)
- ACLS-6 (n = 1, 4.2%) (Chiu et al., 2022)

117 quantitative relationships examined between ACLS scores and cognitive measures, 86 were statistically significant (73.5%).



Su et al. (2011) found that individuals with schizophrenia

- ACL injury. However, statistical significance was not reported. Level 5 (n = 41) demonstrated significantly higher performance than those at Level 4 (n = 35) on processing speed, verbal recall, and working memory. Discriminant analysis correctly classified 78% of participants based on their cognitive profiles.

Van Erp and Steultjens (2020) reported descriptively

- Higher ACLS scores in the anticipatory awareness group (n = 11, M = 5.17 ± 0.66) compared to the emergent awareness group (n = 13, M = 4.77 ± 0.48) among individuals with acquired brain

Discussion

Discussion

What Does the ACLS Measure?

Relationship Patterns with Cognitive Domains

- Strong associations
  - Global cognition, social cognition, executive function, attention, functional cognition
- Variable associations
  - Memory, visuospatial abilities → Reflect construct boundaries rather than measurement limitations

- ✓ **ACLS Task is related to integrated cognition rather than discrete cognitive components ! (Allen, 2018; Earhart et al., 2022).**
- ✓ **Functional cognition is distinct construct from crystalized/ fluid cognition (Baum et al.,, 2022)**

Discussion

Two Distinct Perspectives

Dimension	Neuropsychological Tests	ACLS
Concept	Internal information-processing mechanisms (Lezak et al., 2012)	Observable performance modes
Measurement	Quantitative scores (cognitive capacity)	Ordinal classifications (task engagement)
Content	Discrete capacities under controlled conditions	Sensorimotor information processing during tasks

- The ACLS does not measure the cognitive demands of the task itself, nor does it quantify the amount of cognitive capacity an individual possesses.
- ACLS is designed to indicate the Allen Cognitive Level (ACL) which represents the hierarchical manifestation of qualitatively mode of performance patterns (Allen, 2018).

Discussion

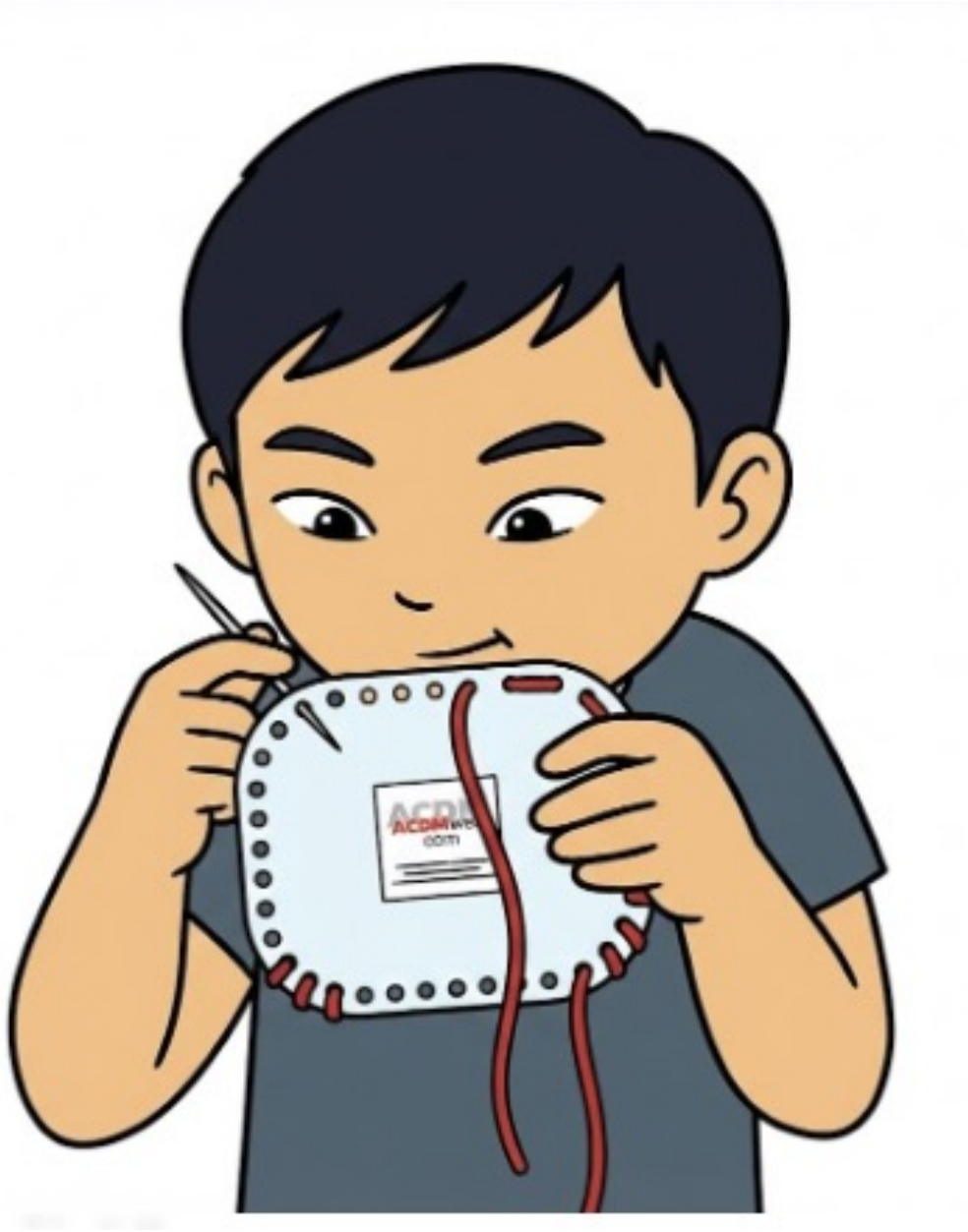
Why Weaker Associations with Memory and Visuospatial Abilities?

Cognitive Domain	Neuropsychological Testing	ACLS Assesses
Memory/learning	Encoding, storage, and retrieval of information (Tulving, 1985)	Moment-to-moment categorization of currently available sensorimotor information
Visuospatial	Mental manipulation of spatial representations (Goodale & Milner, 1992)	Attention to tangible and visible spatial properties during object manipulation

Declarative *Procedural*

Embodied cognition

proposes that cognitive processes are rooted in the body's sensorimotor interactions with the environment, even when decoupled from immediate action (Wilson, 2002).



Discussion

Inconsistencies between ACLS and Cognitive Measurement

Range Restriction

- Studies often recruited participants within limited ACL ranges (e.g., Levels 3–5), reducing variance and attenuating observed correlations. Low association remain undetectable when only a narrow segment of the scale is examined (Cohen, 1988).
- Su et al. (2007) found non-significant correlations with LOTCA-II visual perceptual/spatial subscales when participants reached ceiling scores. In substance use disorder populations, orientation scores averaged 7.73/8 (Rojo-Mota et al., 2017)

Discussion

Inconsistencies between ACLS and Cognitive Measurement

- Strong associations with functional cognition (75% significant, predominantly strong effects)
  - The ACLS demonstrated significant correlations with selective EFPT subscales but did not correlate with organization, completion, or initiation components (Rojo-Mota et al., 2021). The ACDM proposes a hierarchical structure (Allen, 2018; Earhart et al., 2022).
  - In contrast, the EFPT decomposes task performance into executive process components, like initiation, organization, sequencing, safety/judgment, and completion, operating relatively independently (Baum et al., 2008). These differential results suggest the two assessments rating system in same construct.

Discussion

Research Gap We found !

- Critical Gap in Structural Validity Evidence
  - Despite 24 studies examining criterion-related validity, no research has tested the structural validity of the ACLS (Lee et al., 2025)
- Unresolved Questions
  - Do the six levels function as theorized hierarchical structure?
  - Do they form a unidimensional hierarchy? (functional cognition/embodied cognition)
- ACLS-6 Evidence Gap
  - Only 1 study examined the current version
  - ACLS-6 introduced additional tasks to observe sensorimotor information processing, and task complementarity and interchangeability assumptions require empirical verification

Thanks For your attention !