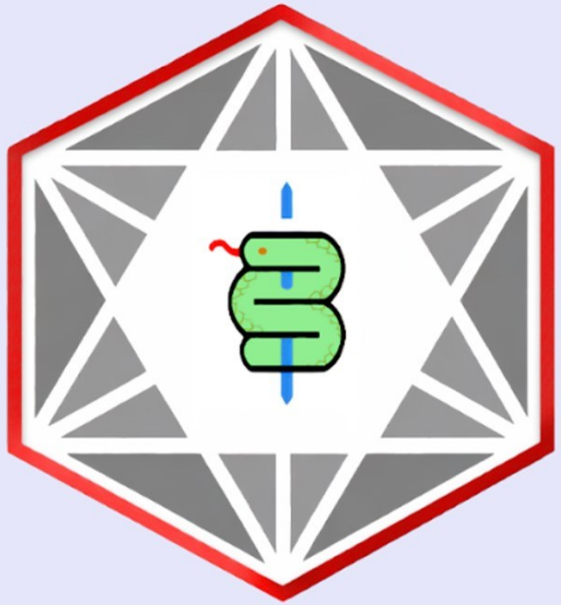
Clinical Cognitive Sciences



CLINICAL COGITIVE SCIENCES LAB

The 2nd Thailand International Conference on Psychology

Chulalongkorn University, 4th August 2023

The moderating role of cognitive reserve between brain markers and cognitive function in Insight 46 and UK Biobank

Visual and auditory cueing in hemispatial neglect

Understanding time perception as a key cognitive function: findings from behavioral and fMRI Research

Estimation of premorbid cognitive function with lexical reading tasks

Estimation of premorbid cognitive function with lexical reading tasks

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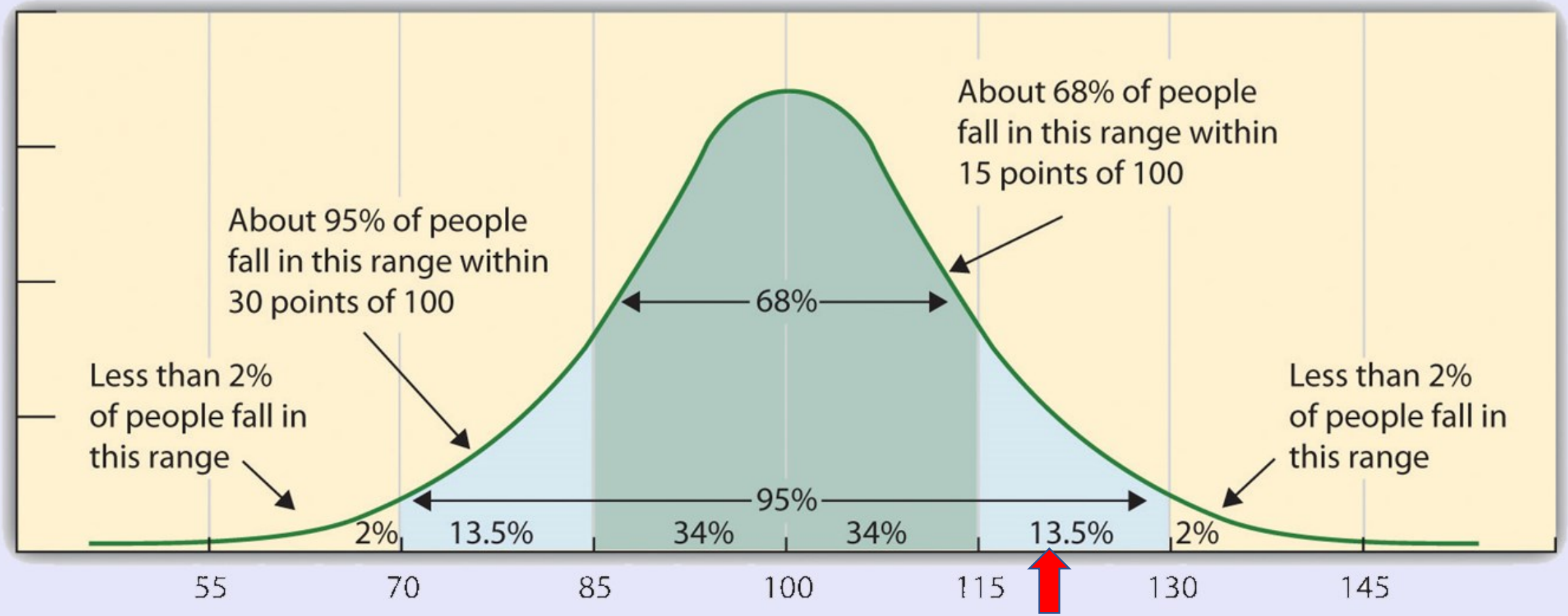
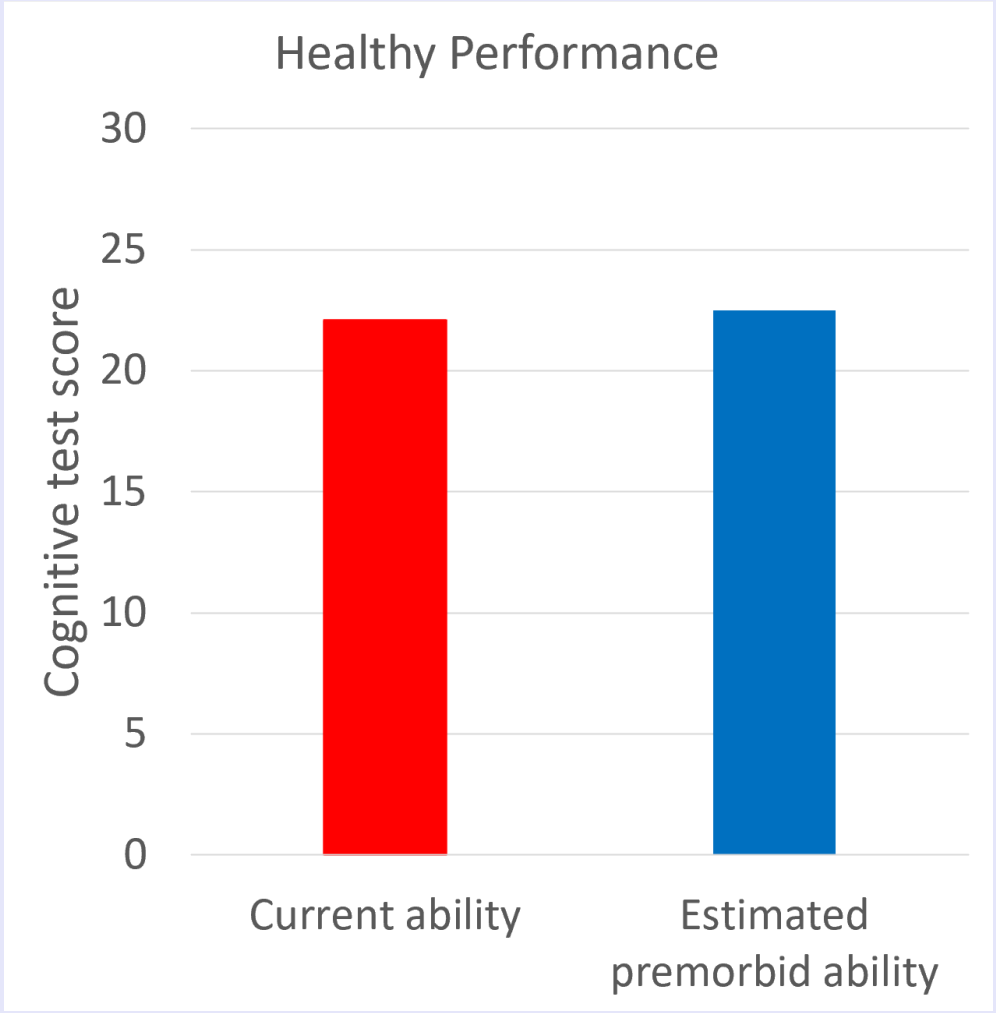
Normal cognitive performance for the population overlaps impaired performance of individuals

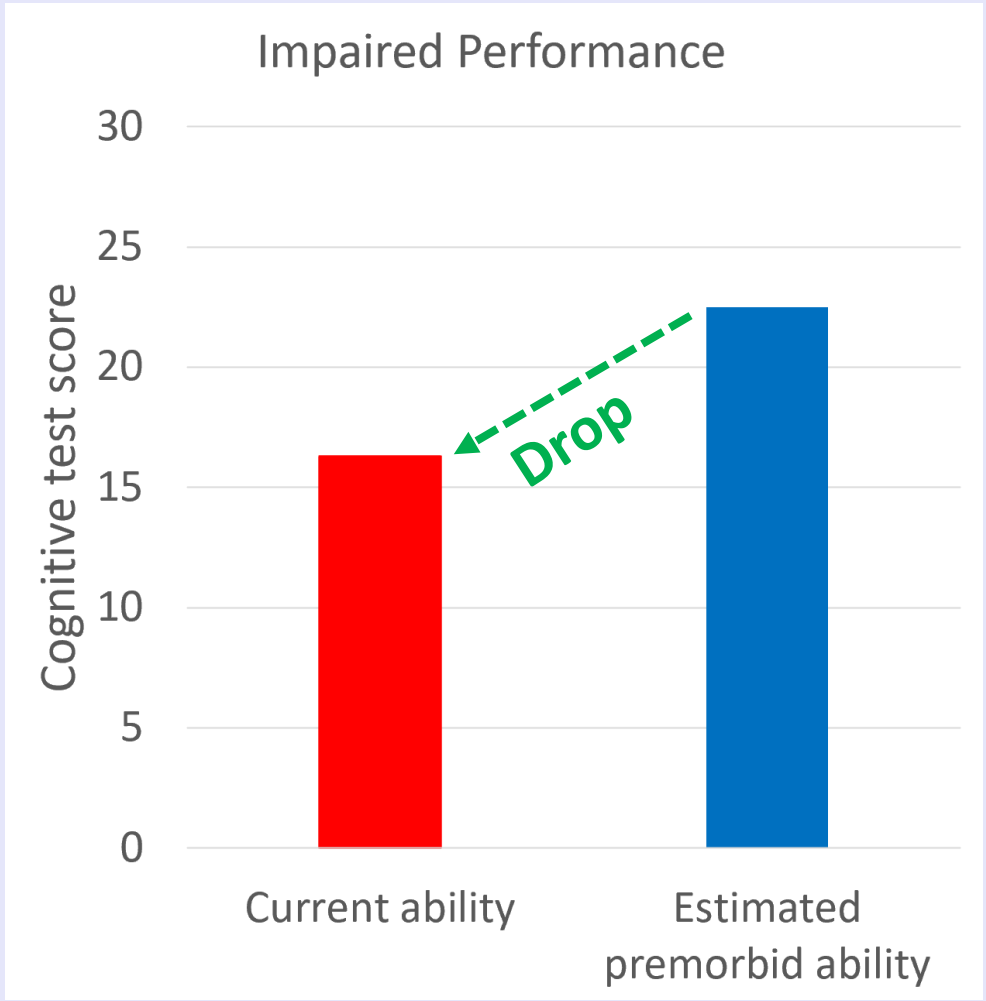


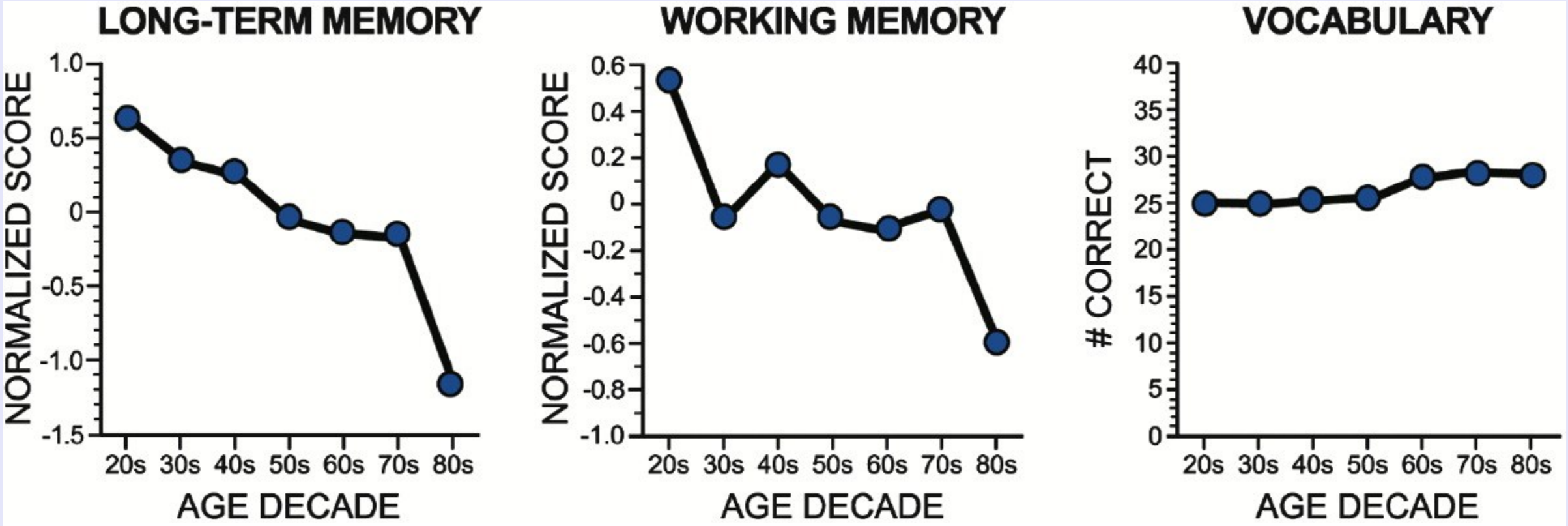
E.g. A patient with neurological illness could suffer a large drop in cognitive ability and still score 'normal'

Personalized cognitive assessment:

- If current ability is lower than estimated premorbid ability, this is evidence of acquired impairment

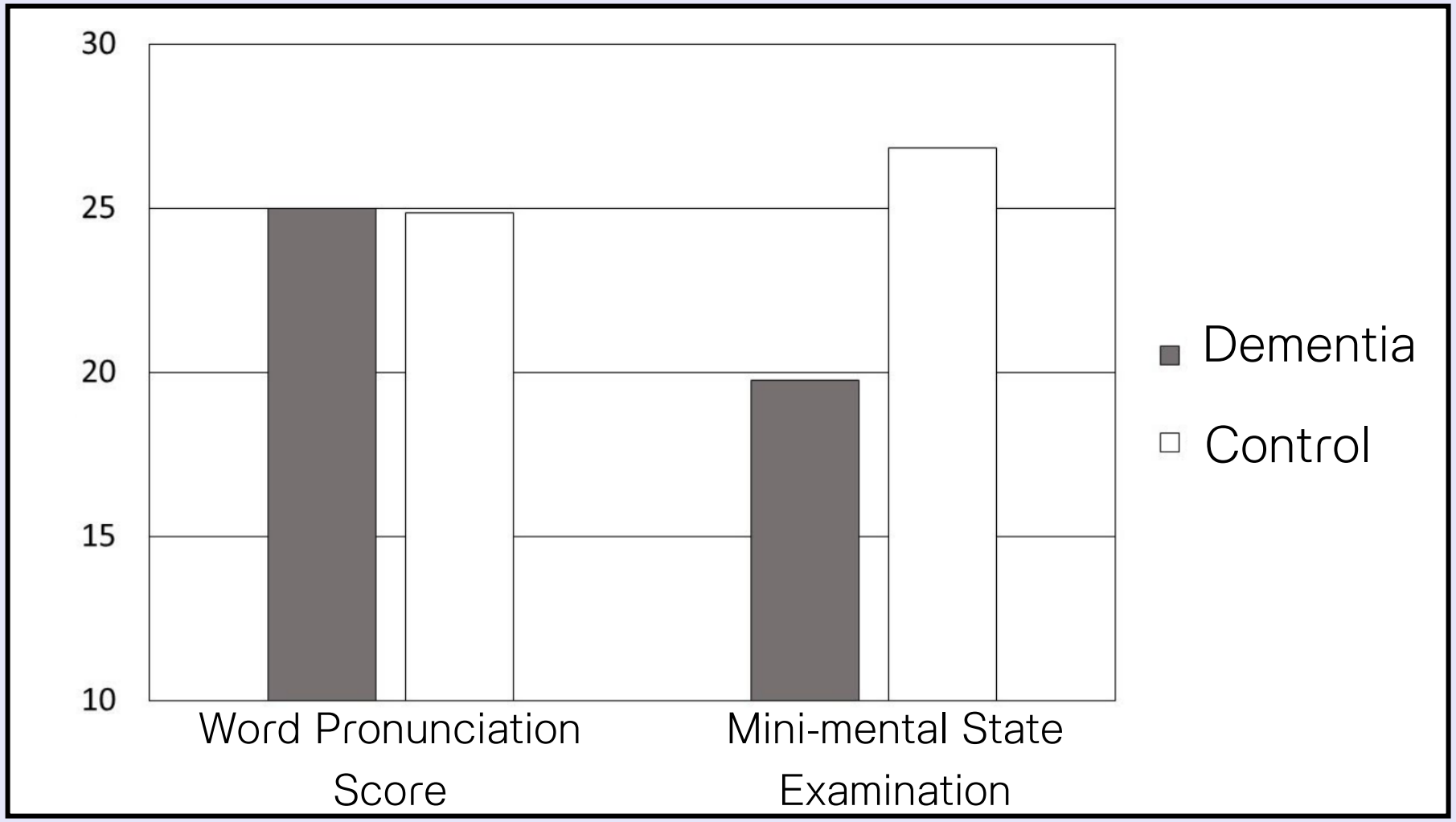






Buckner (2004). Memory and executive function in aging and AD: multiple factors that cause decline and reserve factors that compensate. *Neuron*, *44*(1), 195-208.

Unlike most cognitive abilities, vocabulary does not decline with normal ageing (it actually increases)



Word knowledge has the highest overall association with other cognitive tests

Reading words through lexical routes is resistant to dementia

Pluck et al., (2017). Estimación de la función cognitiva premorbida con el Test de Acentuación de Palabras. Revista Ecuatoriana de Neurología, 26(3), 226-234.

slank	–	chariot
lentil	–	glotex
stamen	–	dombus
loba	–	comet
pylon	–	stroin
scrapten	–	flannel

ชะมอน	—	สิ่ว
ภฤงคาร	—	ภาคเตย์
นาคี	—	โทรจักร
ราโนย	—	กาฬปักษ์
เขบ็ต	—	ปฐิวัลย์
จวัก	—	คเมช

SUPERFLUOUS

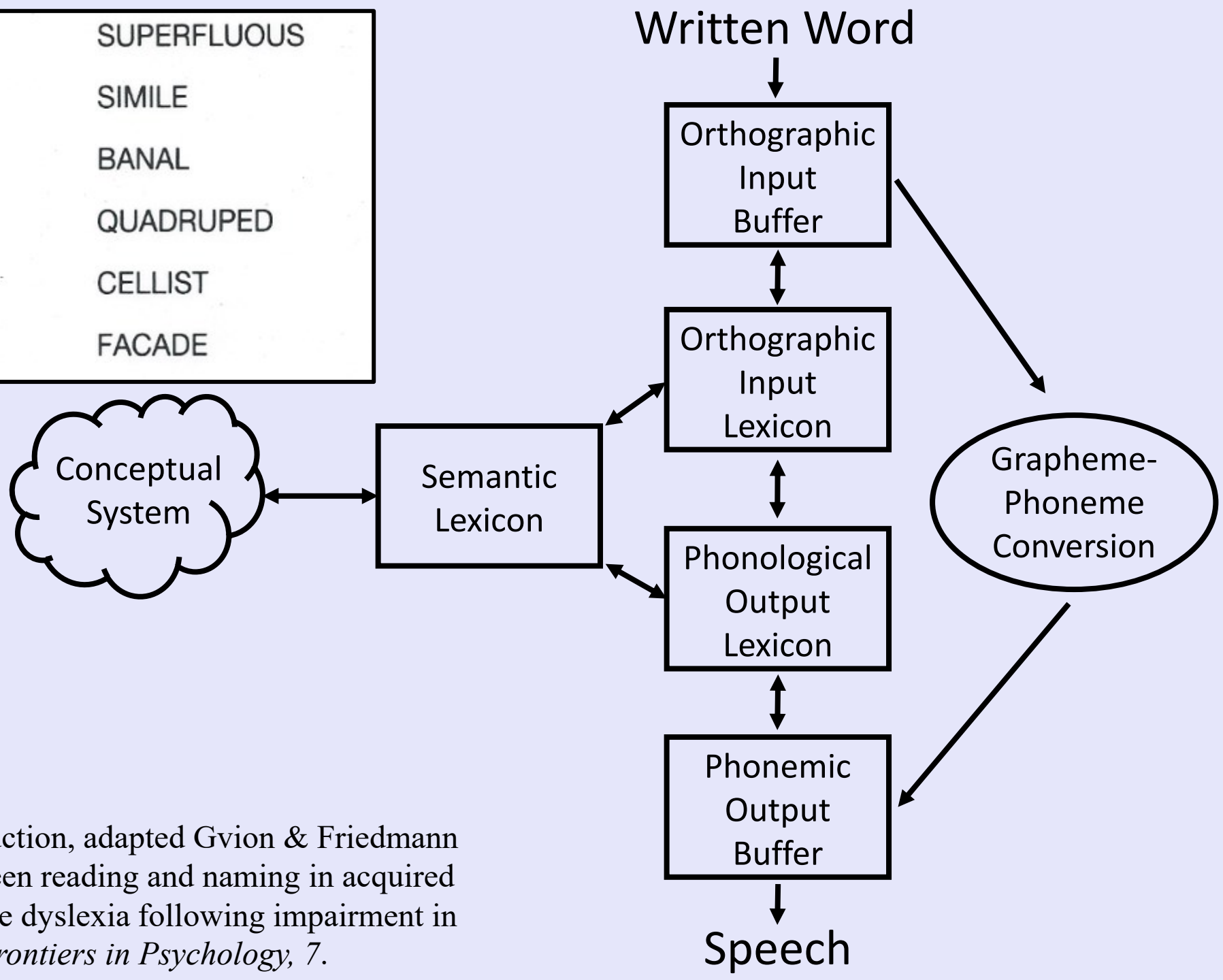
SIMILE

BANAL

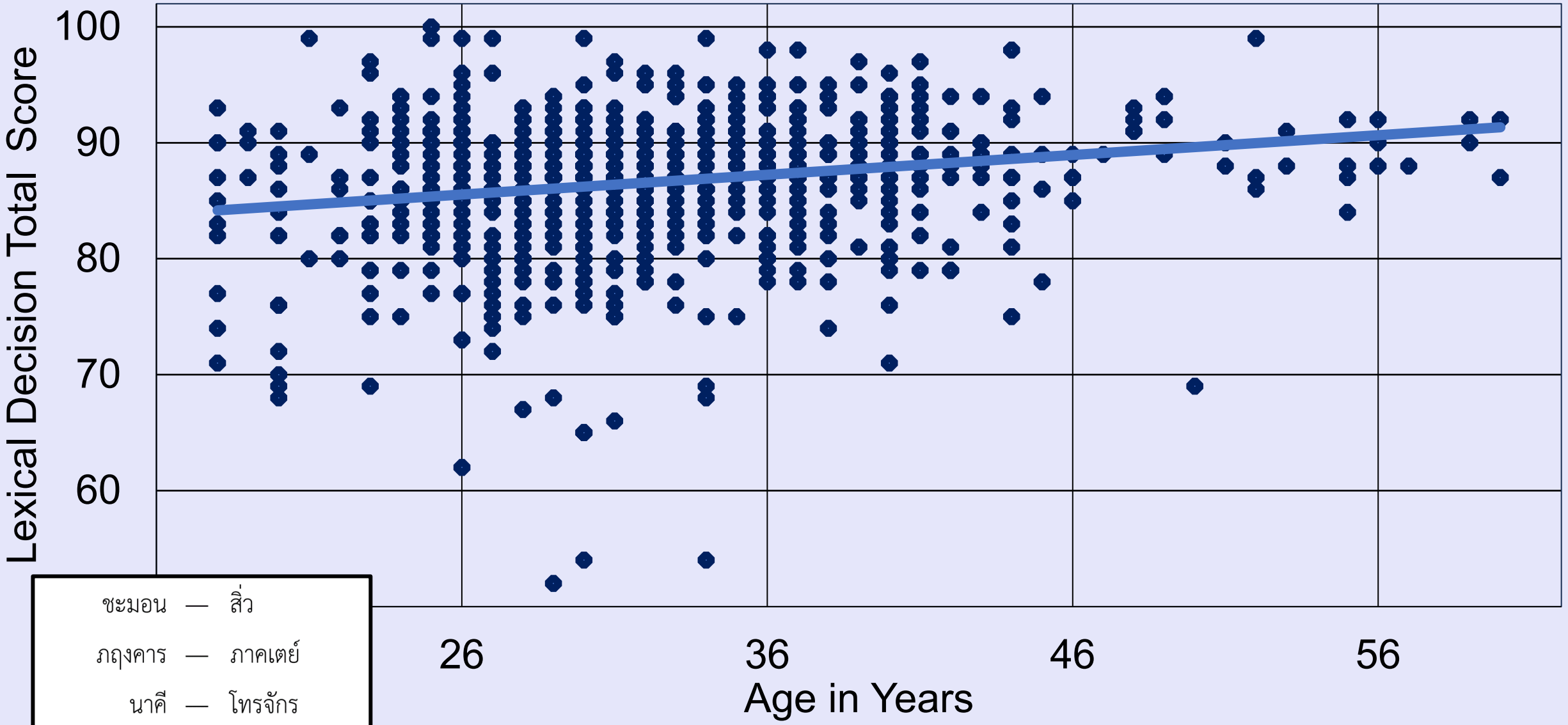
QUADRUPED

CELLIST

FACADE



A cognitive model of speech production, adapted Gvion & Friedmann (2016). A principled relation between reading and naming in acquired and developmental anomia: Surface dyslexia following impairment in the phonological output lexicon. *Frontiers in Psychology, 7*.



ชะมอน	—	สิ่ว
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จวัก	—	คเมช

N = 818 Thai adults: r = .20, *p* <.001

Item Reduction Using ML Techniques

- Why?
  - Increase efficiency - less time taken
  - Increase validity - less error, lower boredom and higher motivation
- Why not? (Maybe)
  - May affect replication of measurements within the instrument
  - May impact reliability
- Variance Inflation Factor (VIF)
  - Staffini et al 2022
    - Statistical Methods for Item Reduction in a Representative Lifestyle Questionnaire: Pilot Questionnaire Study, Staffini et al 2022.
  - Measure of collinearity (e.g. two items which always provide the same answer are not useful)
  - Remove items whose information is already represented by other items
- Automated iterative removal of items

Implementation and Outcomes of Automated VIF

- Steps:
  - Data cleaning - specify location (latitude/longitude), time taken, no. of goal items
  - Measure range for subcategories of sample (key classifiers: e.g. education, proficiency)
  - Loop for number of items to remove (actual - goal)
    - Calculate VIF
    - Remove item with highest VIF
    - Repeat
  - Check ranges for key classifiers and compare with original item list
- Reduction from 100 items to 50
- Range maintained for key classifiers
- Easy to set no. of goal items and reuse
- Can be easily applied to other multi-item questionnaires
- Further work
  - Comparison with/inclusion of other techniques for item reduction
  - User interface development
- Available online for download and use

Internal consistency (Cronbach's alpha)

Full 100 items	α = .78
VIF reduced	α = .74
Removed items	α = .95 (suggests low validity – attenuation paradox)

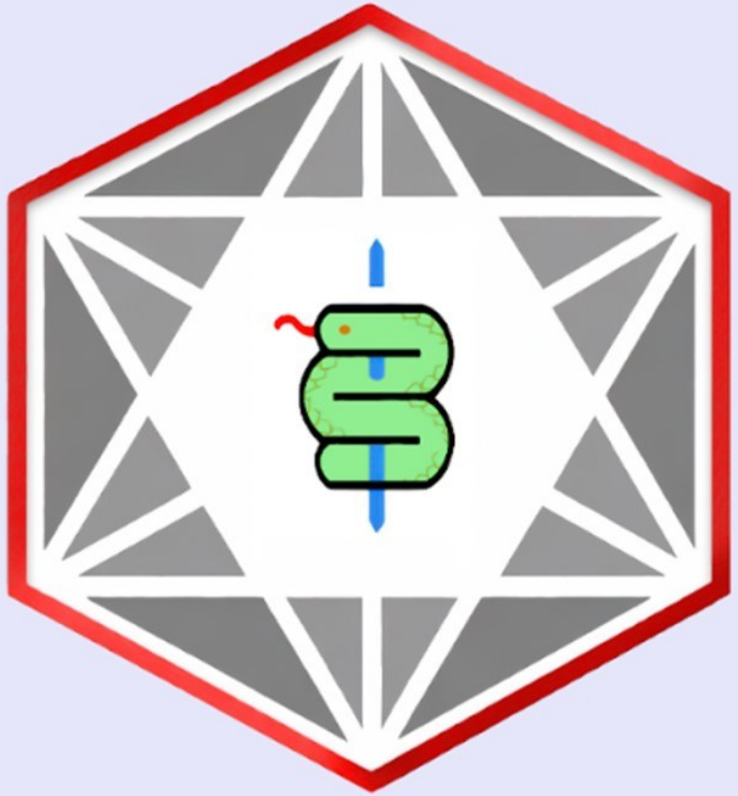
Association with self-report Thai language proficiency (ANOVA):

For 100 items	eta-squared = .042
VIF reduced	eta-squared = .046
Removed items	eta-squared = .015

We are collecting data on a second sample, including standardized cognitive assessments of language skill, to assess the efficiency of the different subsets of items.

- Summary: we have developed a Thai lexical decision task that may be resistant to cognitive changes associated with ageing or disease.
- This research is ongoing, using data science methods to further refine the tool.

Special thanks to the research assistant:
Smriti Sitani



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