



HELLENIC REPUBLIC

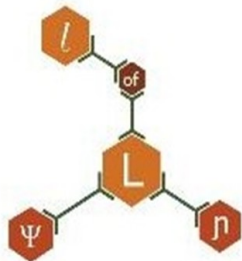
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The relationship between language and executive functions in human communication

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LEFIELD: Language and Executive
Function Intervention Strategies in
Language Disorders

Language and Executive Functions

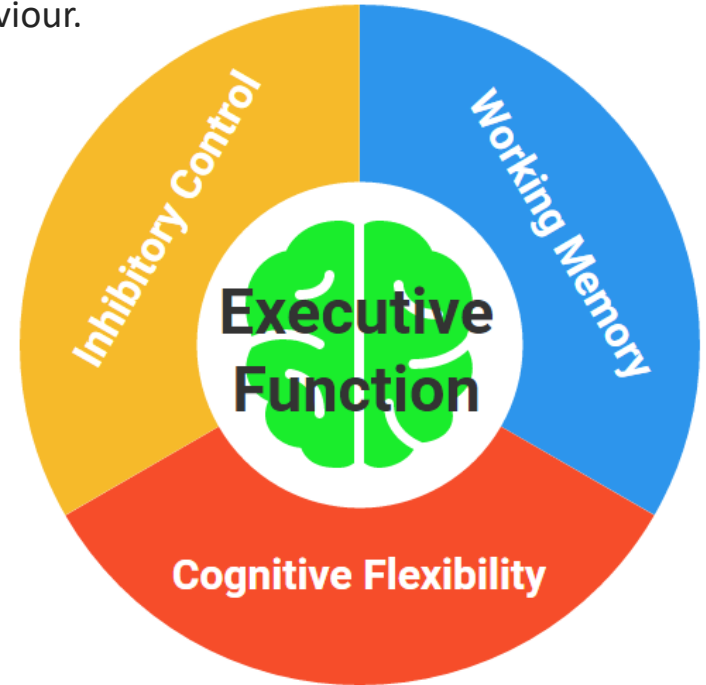
- The ability human beings have to communicate relies upon an **intact language system** but also on higher order cognitive control mechanisms, also known as **executive functions** (EFs), which have been found to affect language processing.
- EFs are a set of **cognitive processes** that are necessary for the **cognitive control of behavior**, that is for selecting and successfully monitoring behaviors required to plan and achieve goals.
- The most well-known EFs include **cognitive flexibility** (the ability to quickly and flexibly adapt behavior to changing situations), **working memory** (the ability to hold information in mind, to mentally manipulate it, and to act on the basis of it), and **inhibitory control** (the ability to act on the basis of choice rather than impulse and to exercise self-control by resisting inappropriate behaviors and responding appropriately).

Executive Functions

A complex construct that encompasses a variety of cognitive abilities that allow for impulse control, strategic planning, cognitive flexibility, and goal-directed behaviour.

Major components:

- 1) **cognitive flexibility** → refers to the ability to flexibly switch between rules, representations, tasks and quickly adjust to changes in the environment
- 2) **working memory** → refers to the ability to simultaneously maintain and use information related to a specific task
- 3) **inhibitory control** → refers to the ability to suppress dominant or automatic responses and resolve conflicts by suppressing irrelevant or distracting information



These complex cognitive processes are closely related to the maturation of the prefrontal cortex (PFC). Due to the delayed maturation of the PFC, EFs are among the last functions to reach maturity.

LEFIELD – Language and Executive Function Intervention Strategies in Language Disorders

- Goal: to investigate cognitive control mechanisms that underlie sentence comprehension and the resolution of ambiguity in language, with special attention paid to the performance of clinical populations with severe impairments in language and/or cognitive control skills.
- Objectives
 - To investigate the contribution of Executive Functions (EFs) to sentence comprehension and the ambiguity resolution performance of atypical children/adolescents and adults in comparison to their typical peers.
 - To investigate the long-term benefits of cognitive treatment to different clinical groups in enhancing their linguistic abilities.

A series of behavioral and eye-tracking tasks investigated sentence comprehension, ambiguity resolution and verbal and non-verbal EFs in (a) children/adolescents diagnosed with high functioning Autism Spectrum Disorder (ASD), (b) children/adolescents diagnosed with Developmental Language Disorder (DLD), (c) individuals with aphasia, (d) neurotypical children/adolescents, and (e) neurotypical adults.

LEFIELD - Findings

- Peristeri, Kamona & Varlokosta (2023)
 - Preserved grammatical skills in autistic children/adolescents
 - Reliance on EF skills to perform successfully in sentence comprehension
 - Sentence processing follows a normal developmental trajectory in children/adolescents with ASD
 - Their difficulty with parsing complex structures stems from reduced EFs rather than deficits in the children's morphosyntactic skills

LEFIELD - Findings

- Peristeri, Drakoulaki, Boznou, Nerantzini, Gena, Lengeris, Varlokosta, S. (in progress)
 - Autistic children/adolescents face difficulty with projecting prosodic boundaries onto their oral narrative production
 - This difficulty is related to the children's syntactic and EF abilities

LEFIELD - Findings

- Peristeri, Nerantzini, Drakoulaki, Boznou, Varlokosta, S. (in preparation)
 - Individuals with agrammatic aphasia perform significantly lower than controls in syntactic complexity, in narrative macrostructural measurements, as well as in tasks that tapped Efs
 - Narrative performance in individuals with agrammatic aphasia is not supported by their EFs, as is the case for controls.
 - Enhancing EFs in individuals with agrammatism may be beneficial for their narrative production

Cognitive control protocol - LEFIELD

Baseline
Testing

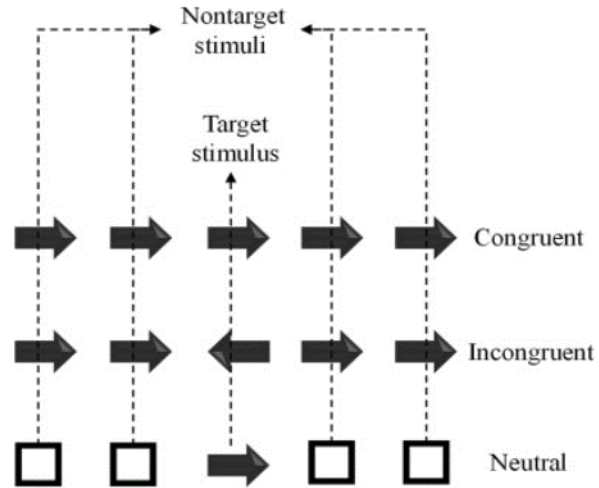


Cognitive
Treatment



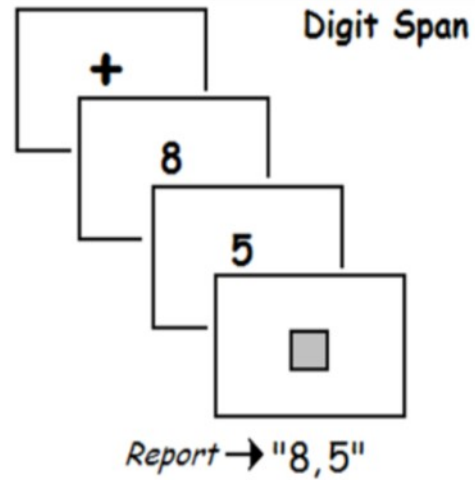
Follow up
assessment

Baseline – Flanker task



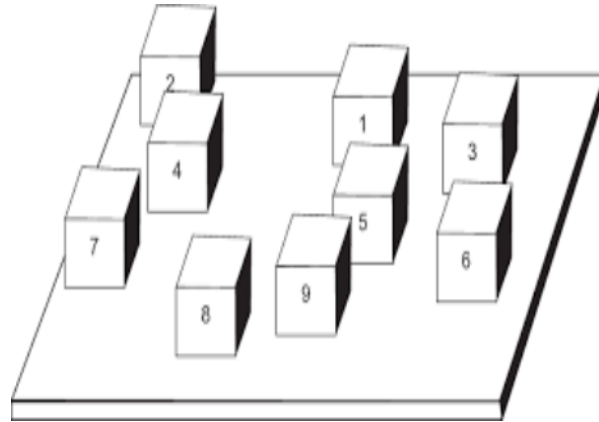
Selective attention, cognitive flexibility; Inhibition of cognitive interference

Baseline – Digit span task



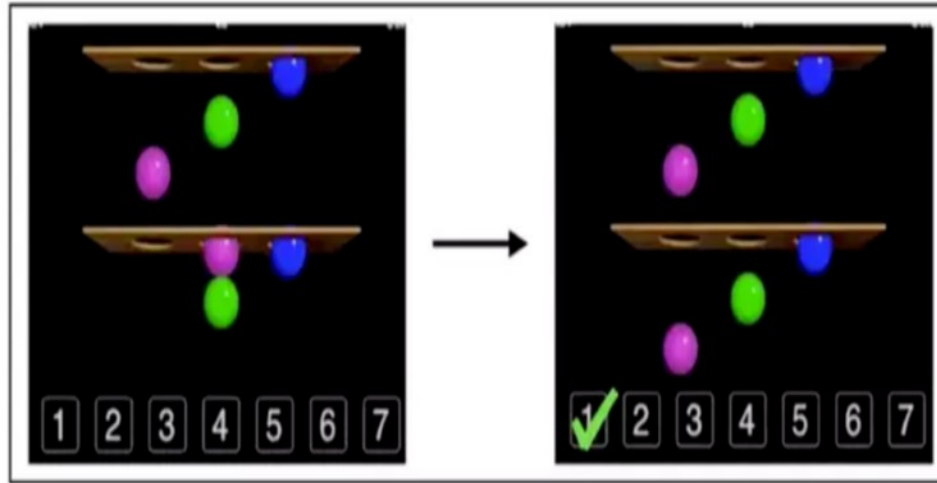
Working memory

Baseline – Corsi-Block tapping task



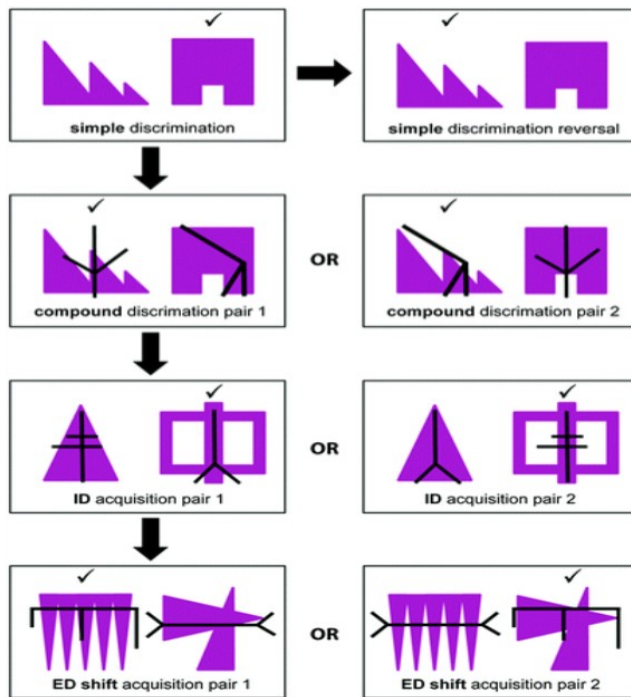
Visuo-spatial
Working memory

Baseline – One touch stockings of Cambridge task



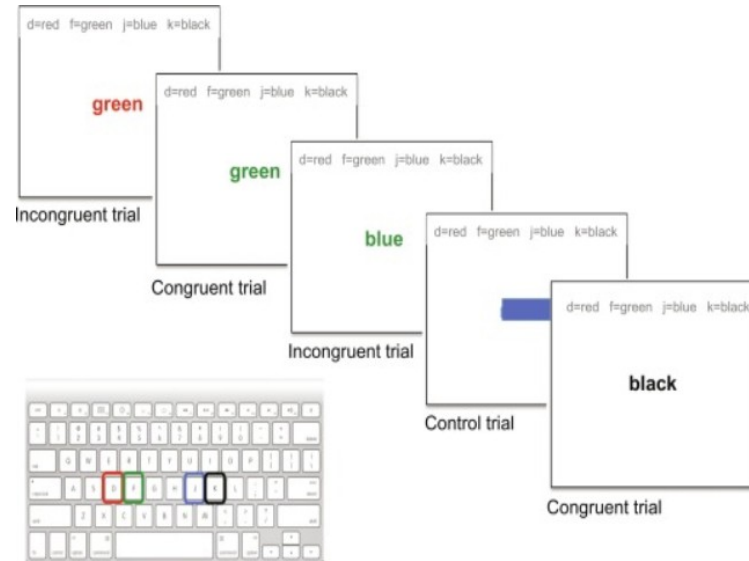
Spatial planning
Working memory

Baseline - Intra extra dimensional set shift task



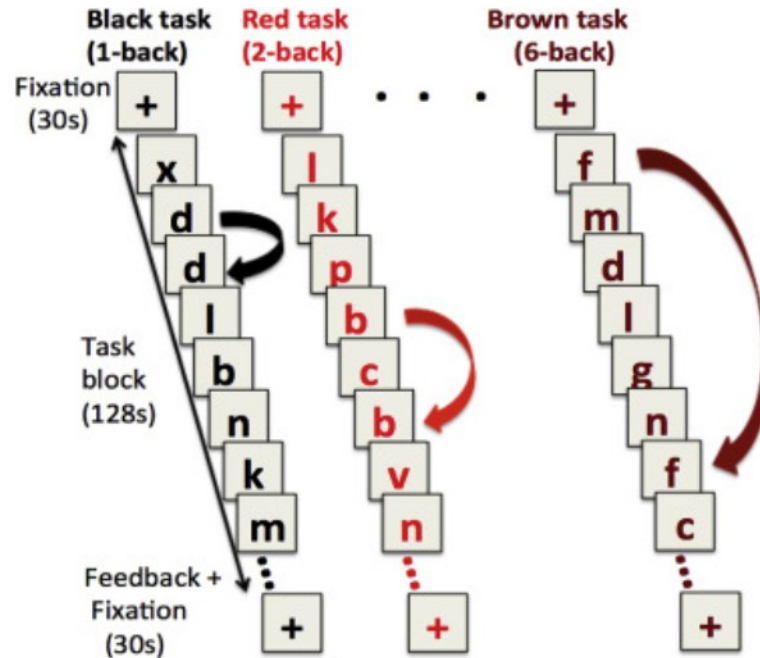
Attention shift

Cognitive treatment – Stroop task



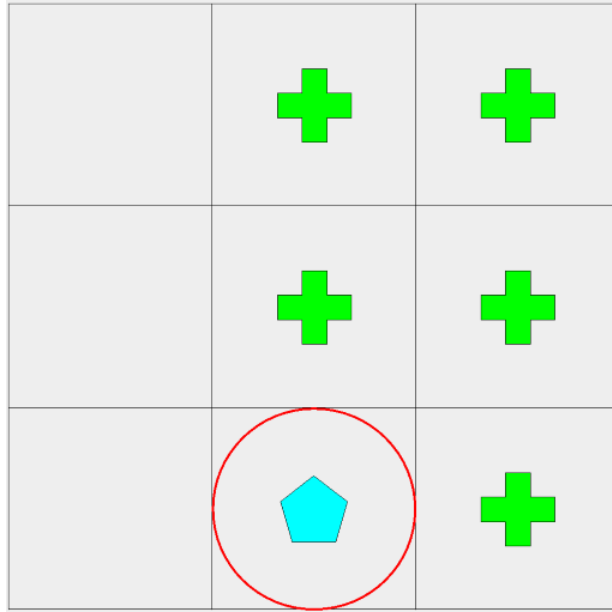
Selective attention, cognitive flexibility; Inhibition of cognitive interference

Cognitive treatment – N-back task



Working memory

Cognitive treatment – TrackIt task

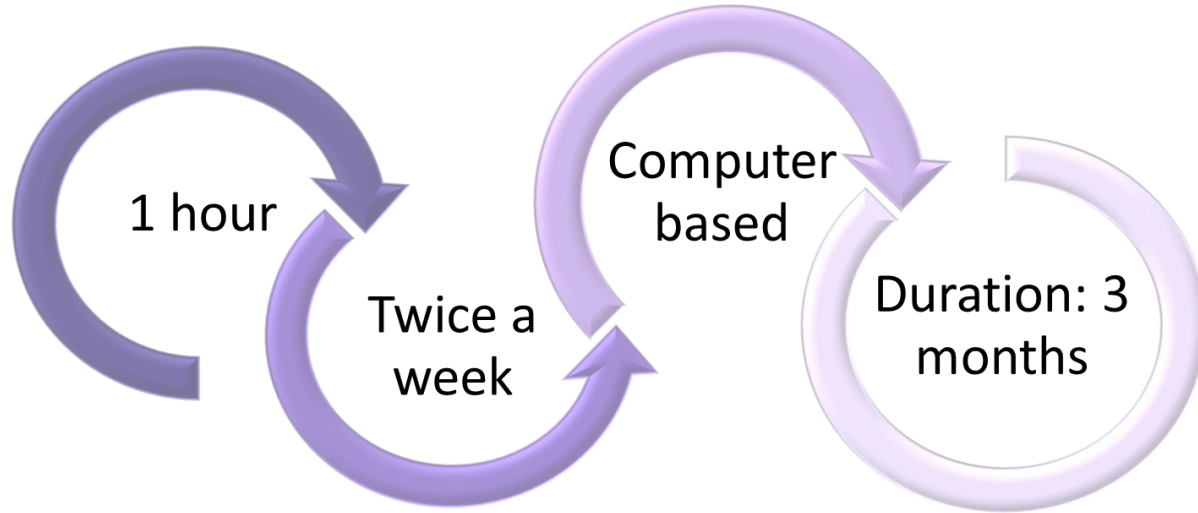


Sustained selective
attention

Follow up assessment

- Complete language and cognitive evaluation
 - Language evaluation in LEFIED
 - Eye tracking task for the processing of syntactic ambiguity or
 - Online self-paced reading task for the processing of syntactic ambiguity (when eye tracking was not possible)
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Implementation



Acknowledgment

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Thank you!

Time For
Questions