

WHEN THINGS GO WRONG IN READING

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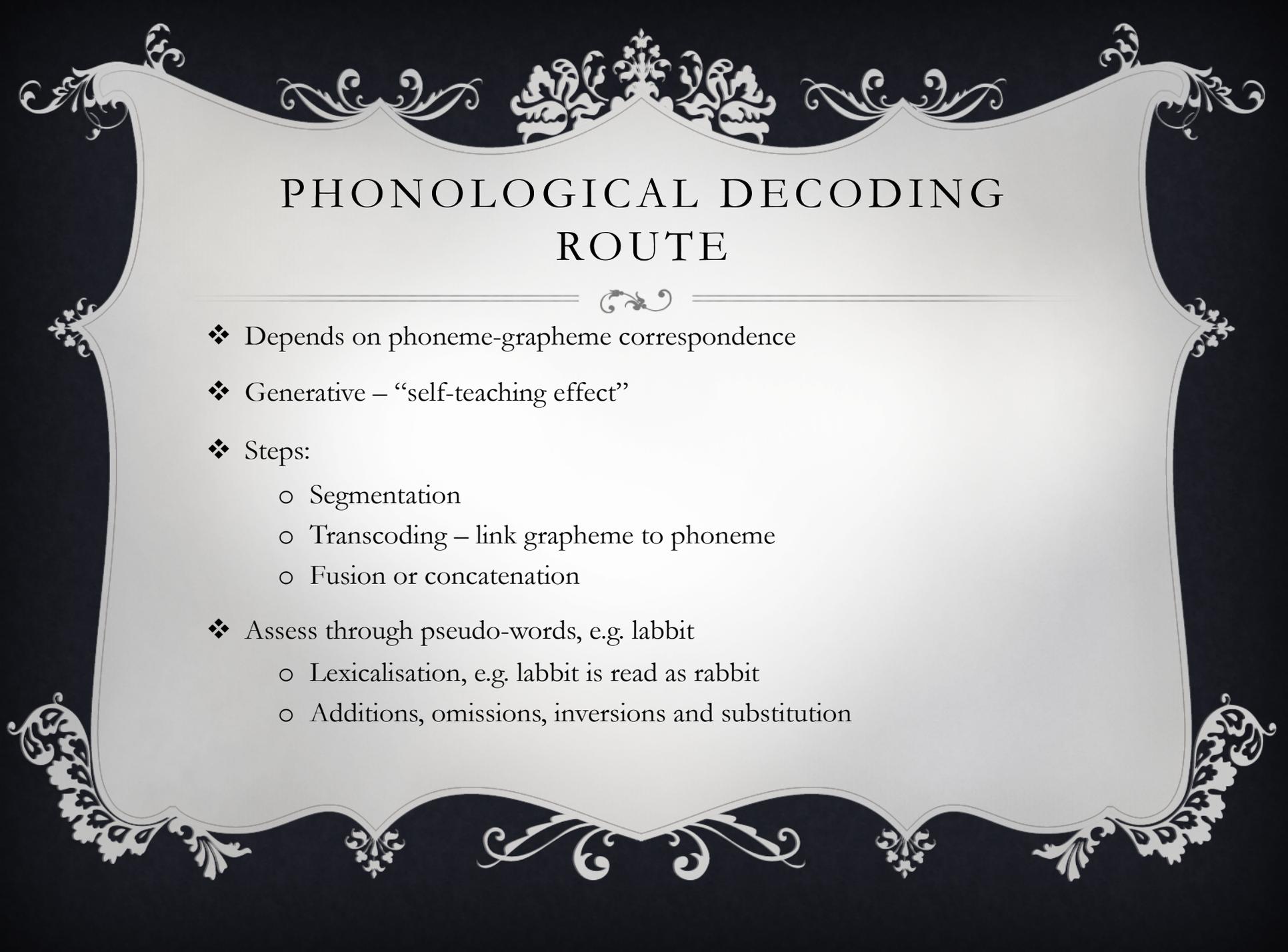
ACKNOWLEDGEMENTS

This presentation draws widely on the works of:

- ❖ Prof Stanislas Dehaene – Reading in the brain
- ❖ Dr Jenny Thomson – University of London
- ❖ Dr Duncan Milne – Teaching the brain to read
- ❖ All other sources can be found under references

TYPES OF LANGUAGES

- ❖ Logographic languages
- ❖ Transparent languages
 - Letter-sound (grapheme-phoneme) connections are regular
 - Phonological awareness – predictor of reading achievement
 - Phoneme most important component
- ❖ Less transparent languages
 - Lots of irregularities or exceptions
 - Onset and rime patterns become more important



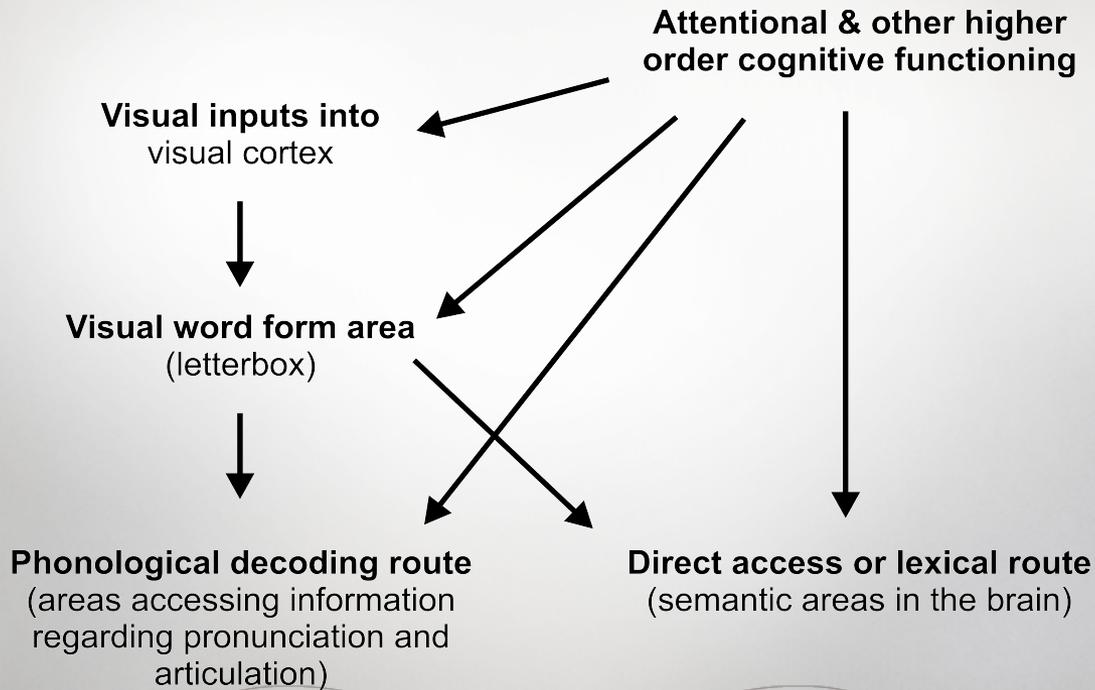
PHONOLOGICAL DECODING ROUTE

- ❖ Depends on phoneme-grapheme correspondence
- ❖ Generative – “self-teaching effect”
- ❖ Steps:
 - Segmentation
 - Transcoding – link grapheme to phoneme
 - Fusion or concatenation
- ❖ Assess through pseudo-words, e.g. labbit
 - Lexicalisation, e.g. labbit is read as rabbit
 - Additions, omissions, inversions and substitution

DIRECT ACCESS OR LEXICAL ROUTE

- ❖ After lots of repetition
 - Develops only after years of practice
 - Creates illusion of whole word reading though fast and efficient automatization of processes
- ❖ Depends on establishment of a direct connection between visual and auditory systems
- ❖ Leads to less mistakes and is faster
- ❖ Used most often by fluent readers
 - Left hemispheric dominance for processing in reading occurs
 - Prosody still processed in right hemisphere
- ❖ Assess using irregular words, e.g. said
 - Mistake = regularisation e.g. sa-it

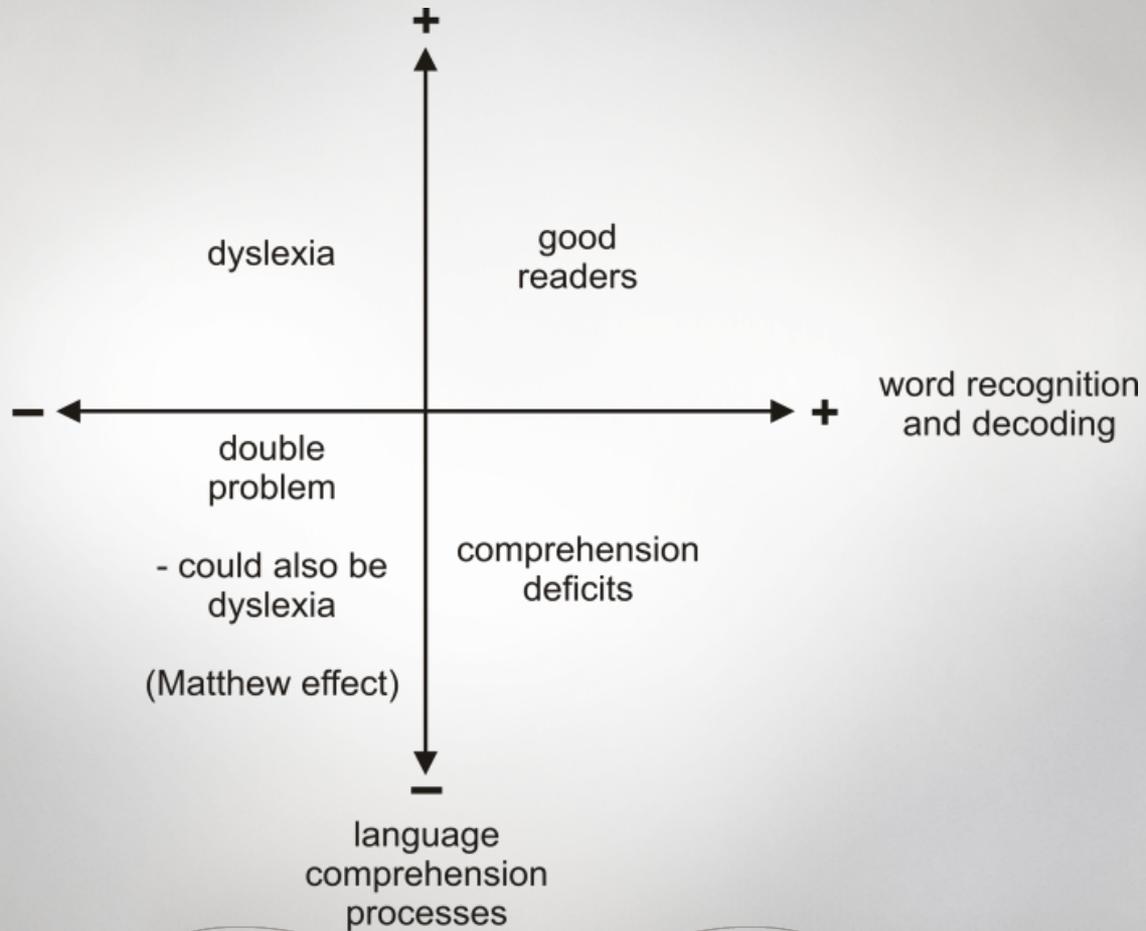
FLUENT READERS



CAUTION

It is often very difficult to discriminate poor reading ability due to dyslexia from poor reading ability due to other factors

- ❖ Auditory or auditory perception deficits
- ❖ Low intelligence
- ❖ Poor teaching or poor motivation to learn
- ❖ Complexity of language, i.e. non-transparent languages
- ❖ Poor socio-economic background



DYSLEXIA

- ❖ Disproportionate difficulty in learning to read
- ❖ Occur in 5-15% or 5-15% of children (depending on source)
- ❖ Neurologically based
 - Several genes contributes to the development of dyslexia
 - How can this be if reading is NOT innate?
- ❖ Often hereditary
 - Siblings of child with dyslexia have a 50% chance to have dyslexia too
 - Parents with dyslexia are more likely to have children with dyslexia

CAUSES

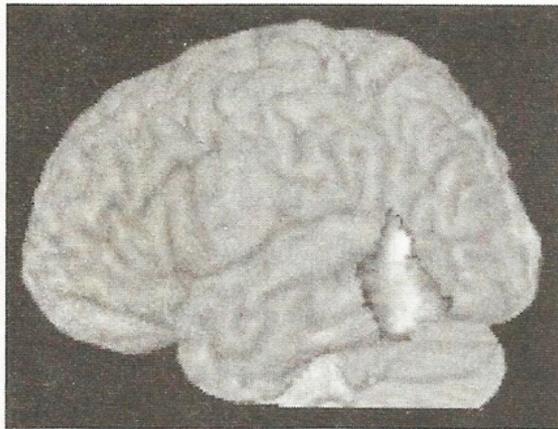
- ❖ Most children with dyslexia have phonological difficulties
 - Processing of phonemes or speech sounds
 - And consequently linking phonemes to graphemes
 - But later also have reading comprehension difficulties
- ❖ Rare cases have dyslexia caused by left-right confusion and spatial difficulties
 - Leads to extensive spatial reversals of letters, e.g. “m” and “w”, “b” and “d”
 - Leads to mistakes in the ordering of letters in words, e.g. “snail” is read as “nails”
 - Leads to inversion of word order at sentence level

CAUSES

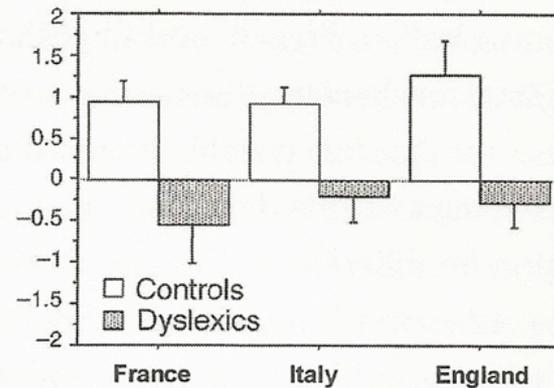
- ❖ Some children with dyslexia have difficulties with foundational sensory perception
 - Auditory perceptual processing
 - Visual perceptual processing
- ❖ Some children struggle to automatise the link between visual information and speech – Rapid automatised naming tests
- ❖ So what does neuroscience say:
 - Joint deficits in the visual and speech circuits
 - Specifically deficits in invariant visual recognition and phonological processing

REDUCED BRAIN ACTIVATION

Physiology of dyslexia



Brain activation during reading

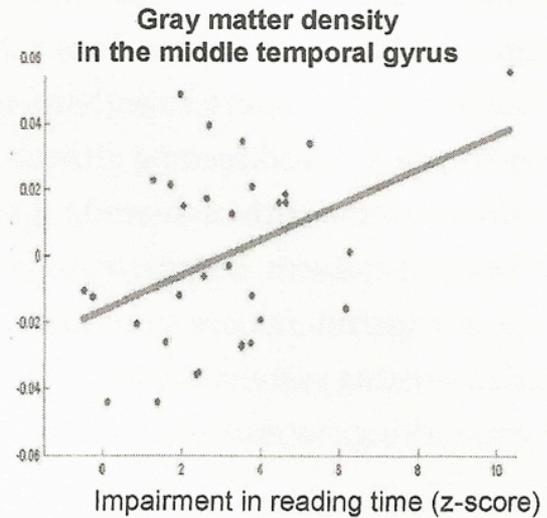
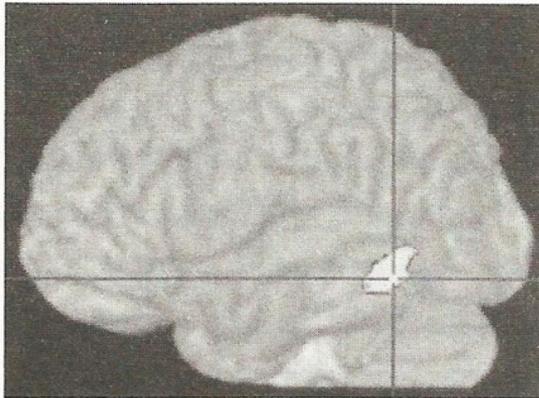


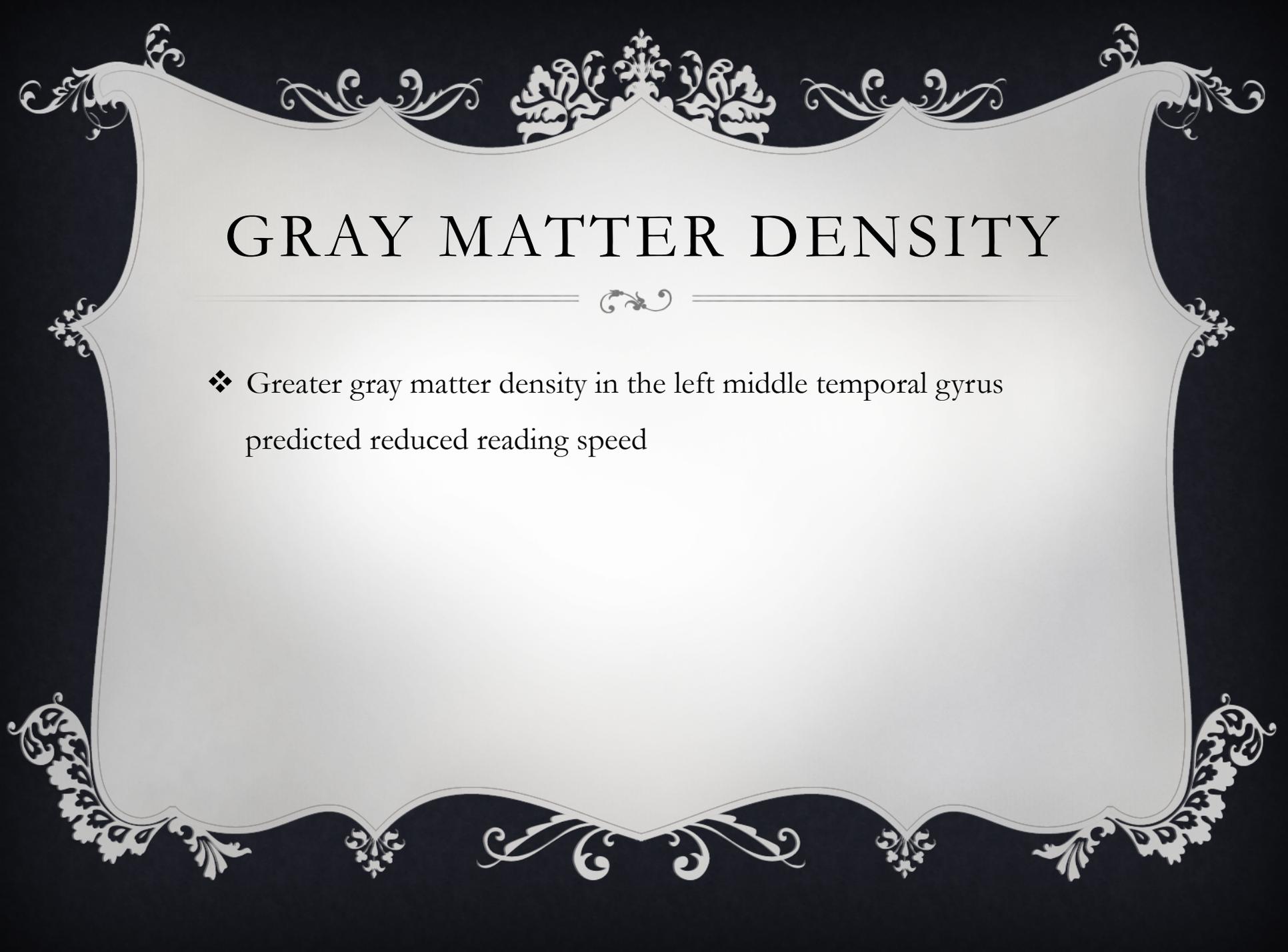
REDUCED BRAIN ACTIVATION

- ❖ Under-activation in the phonological information in speech
 - Explains the high frequency of difficulties with processing phonological information in children with dyslexia
- ❖ The bigger the under-activation in the word form area (letterbox)
the more severe the reading impairment
 - Impairment in the invariant visual letter recognition
- ❖ In contrast,
 - Broca's area is often hyper-activated
 - So is right temporo-parietal areas

GRAY MATTER DENSITY

Anatomy of dyslexia

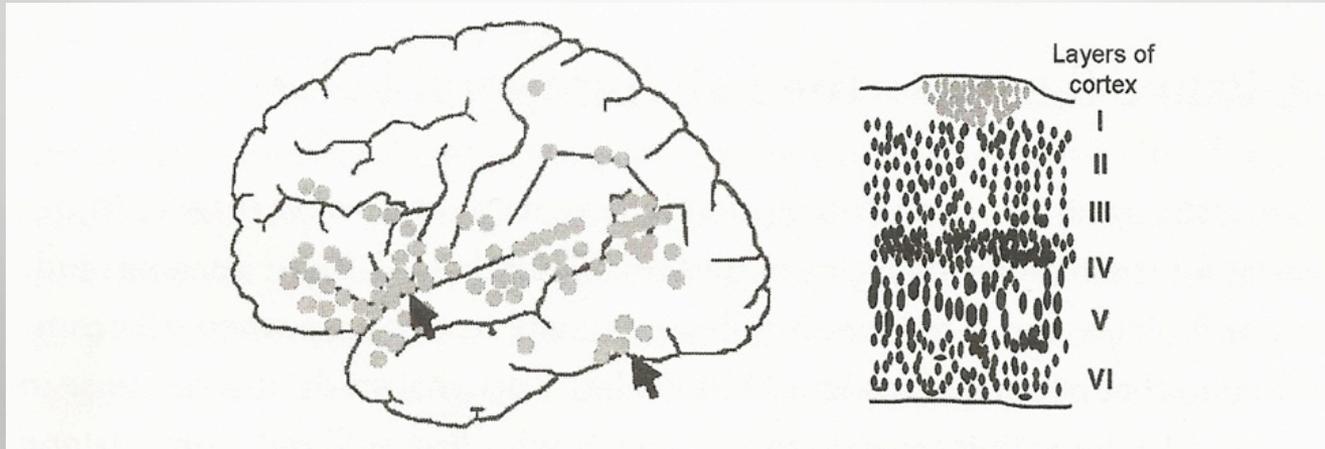




GRAY MATTER DENSITY

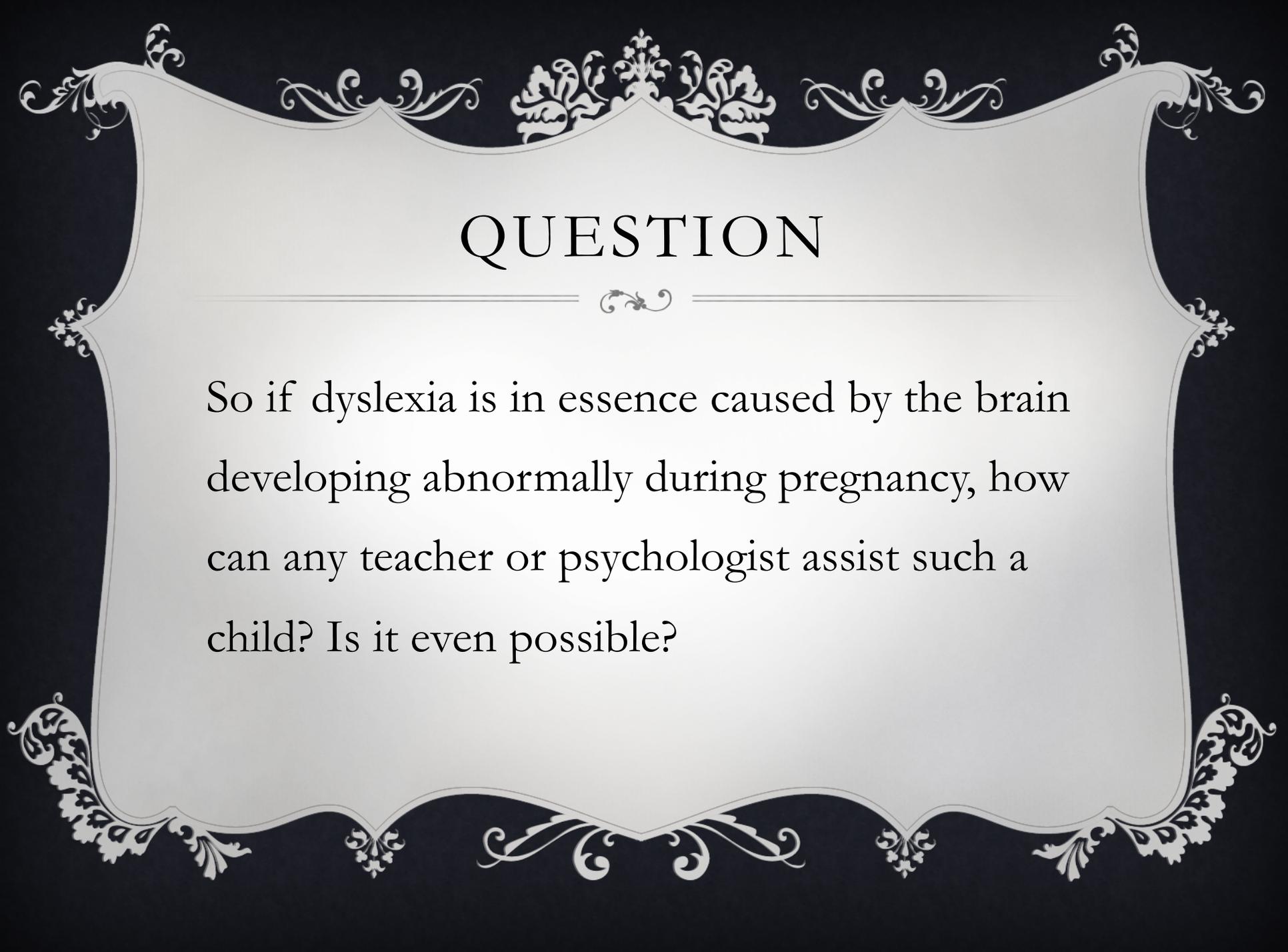
- ❖ Greater gray matter density in the left middle temporal gyrus
predicted reduced reading speed

NEURONS OUT OF PLACE



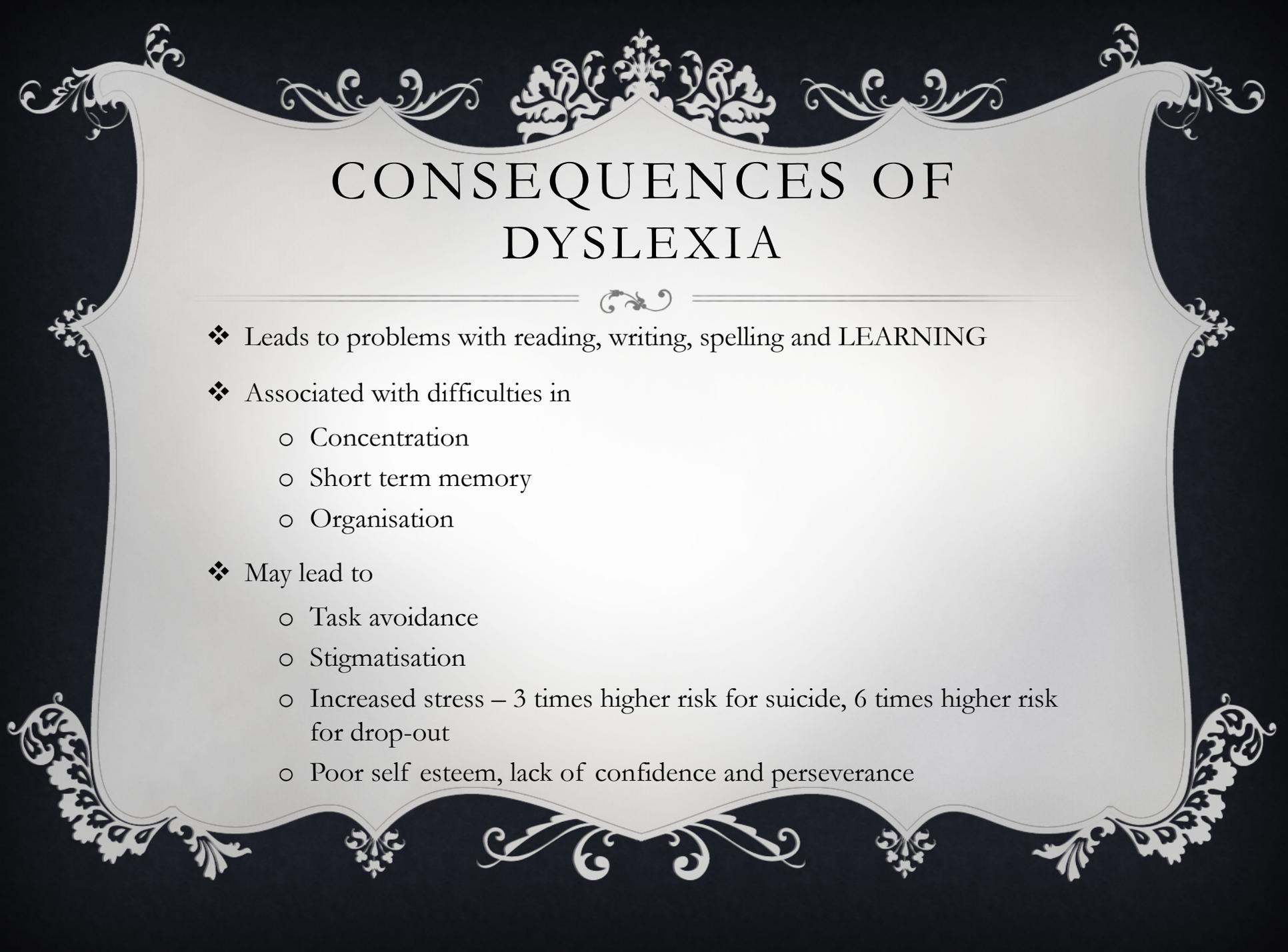
NEURONS OUT OF PLACE

- ❖ During pregnancy neurons travel from where they are formed near the ventricles (inner spaces of the brain) to the cortex (outer layer of the brain)
- ❖ In brains of people with dyslexia ectopias (misplacement of neurons) occur in the layers of the cortex in both areas processing speech and the word form area (letterbox)
 - Leads to impairment of the connections of these neurons
 - A thin fibre bundle under left temporo-parietal area is impaired in people with dyslexia
 - Leads to disconnection in information flow



QUESTION

So if dyslexia is in essence caused by the brain developing abnormally during pregnancy, how can any teacher or psychologist assist such a child? Is it even possible?



CONSEQUENCES OF DYSLEXIA

- ❖ Leads to problems with reading, writing, spelling and LEARNING
- ❖ Associated with difficulties in
 - Concentration
 - Short term memory
 - Organisation
- ❖ May lead to
 - Task avoidance
 - Stigmatisation
 - Increased stress – 3 times higher risk for suicide, 6 times higher risk for drop-out
 - Poor self esteem, lack of confidence and perseverance



HELPING RULES

- ❖ Short intervention sessions (10 to 30 minutes) daily for several weeks
- ❖ Interventions interspaced by sleep is more effective
- ❖ Make it fun, interesting and attention grabbing
- ❖ Computer games are amazingly effective
- ❖ Start at where the learner is and not where the learner should be
- ❖ Reading improves reading

HELPFUL STRATEGIES

- ❖ Explicit teaching of phonemic awareness
- ❖ Explicit teaching of alphabetical principle
- ❖ Simultaneous teaching of graphemes and phonemes
- ❖ Segmentation, e.g.
 - Syllables - use tokens, or hand under chin
 - Onset & rime for English
 - Phonemes for transparent languages
- ❖ Phonics programme must be structured and sequential, e.g.
 - teach regular frequently used phonemes first
 - simple digraphs (sh) before complex patterns (-tion)



HELPFUL STRATEGIES

- ❖ Multisensory teaching
 - feel pronunciation,
 - use concrete letters or tokens

- ❖ Metacognitive, e.g.
 - Reflexive pause
 - Self questioning

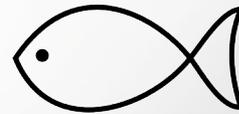
- ❖ Learning strategies, e.g.
 - LCWC (look, cover, write, check) for irregular words
 - SOS (simultaneous oral spelling) for regular words

- ❖ Reduce memory and attention load

HELPFUL STRATEGIES

- ❖ Explicitly teach vocabulary, especially subject specific vocabulary
 - Word walls
 - Personal dictionaries
 - Clue cards/picture dictionary

fish



SURPRISING TECHNIQUES

- ❖ Early musical notation training impacts positively on later reading scores
 - Children learn to map a symbol/note onto a sound
- ❖ Cursive writing and explicit left-write tracing of letters
 - Coloured lines
 - Cat's head, body and tail



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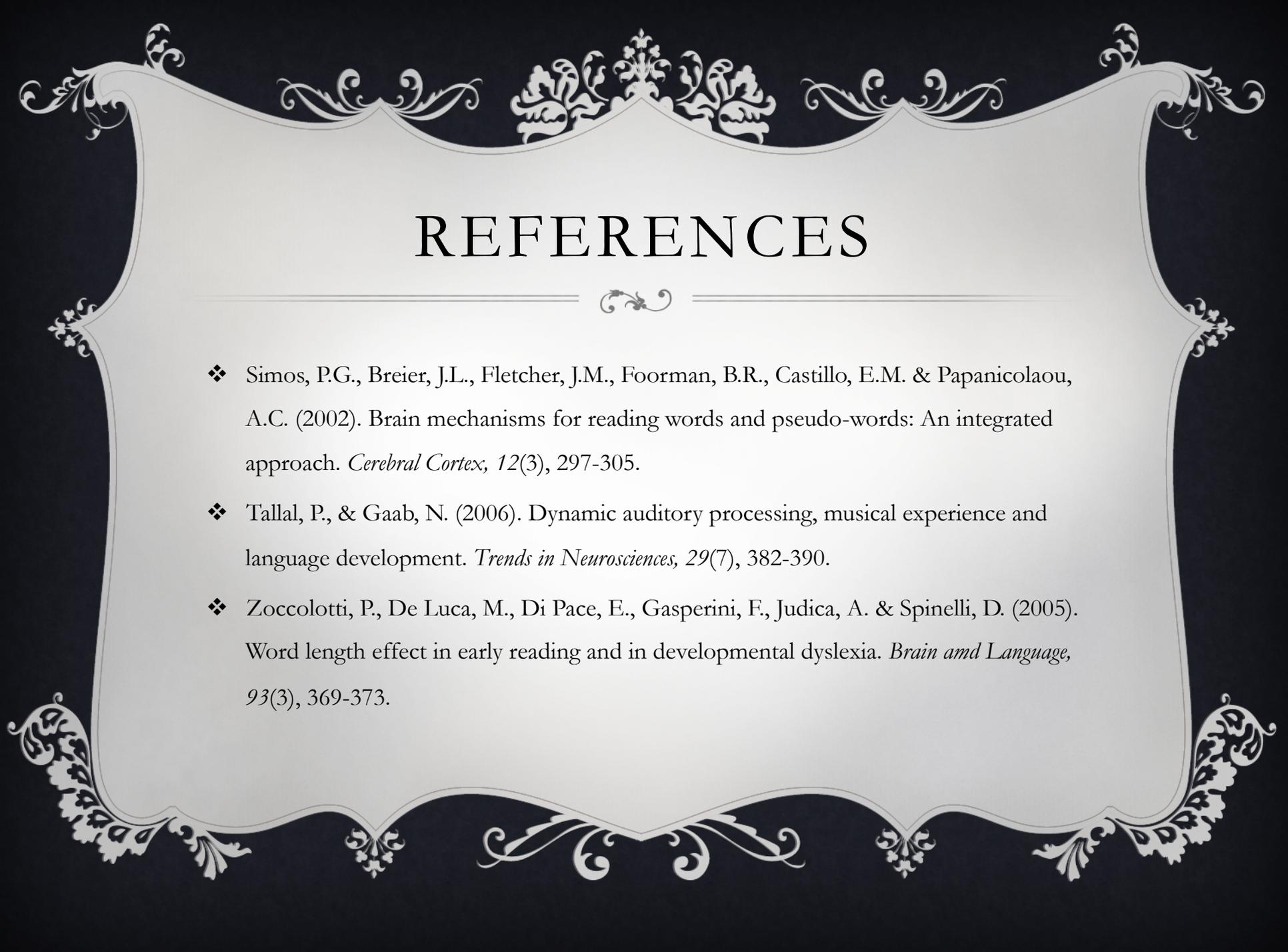
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