

Formal vs Functional Linguistic Competence

- LLMs exhibit (near) human-level formal competence (at least in English) but „patchy“ functional competence [6]
- In human brains, the *language network* is responsible for formal linguistic competence — it responds when people comprehend or generate sentences, but not when they perform reason about people’s mental states, process non-verbal communicative information etc.
- The functional linguistic competence is supported by different regions of the brain: among others, by *multiple demand network* that is reliable for logic, reasoning, and a lot more, and by *default network* that tracks both linguistic and non-linguistic narratives over a long period of time (the *language network* in humans does not appear to track structure above the clause level)
- For example, despite the nearly complete loss of linguistic abilities, persons with severe aphasia can have normal non-linguistic cognitive abilities [6]

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- „Give language models a break!": given a strict separation of linguistic and non-linguistic capabilities in the human mind, we should evaluate these capabilities separately [6]
 - Counter-argument: individuals with aphasia can be tested for their non-linguistic cognitive abilities (e.g. composing music), LLMs not [7]
- LLMs and the human *language network* exhibit non-trivial similarities [6]
 - LLMs learning features like POS, NER, and semantic roles at various layers [6]
- => Opinion: it might be beneficial to not try to train LLMs for functional abilities but rather *augment* LLMs with specific modules since „language and formal reasoning are distinct cognitive capacities that work best when they are supported by separate processing mechanisms“ [6]

However, since the language inputs contain wealth of information about the world, and language is „a crucial data source ... for much of people's world knowledge“, LLMs can still gain functional linguistic competence [6]