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intuitions, N400 effects in this study showed that there were higher processing costs for distal demonstratives ("that") compared to proximal demonstratives ("this") when speaker and addressee were facing each other and when all possible referents were located in the shared space between them. This effect was observed irrespective of the physical proximity of the referent to the speaker (Figure 1). These findings reject egocentric proximity-based accounts of demonstrative reference, and instead support a sociocentric approach to referential communication. They suggest that interlocutors construe a shared space during conversation, and imply that the psychological proximity of a referent may be more important than its physical proximity.

In dialogue with an avatar

The use of virtual reality (VR) as a methodological tool is becoming increasingly popular in behavioural research as its flexibility allows for a wide range of applications. This new method has not been as widely accepted in the field of psycholinguistics, however, possibly due to the assumption that language processing during human-computer interactions does not accurately reflect human-human interactions. Yet at the same time, there is a growing need to study human-human language interactions in a tightly controlled context, which is not always possible using existing methods. As VR offers such control, Heyselaar tested whether human-computer language interaction is comparable to human-human language interaction by inviting participants to complete a standard syntactic priming task in the Virtual Reality lab. Participants completed the task with a human partner (confederate), a human-like 'good' avatar, and a computer-like 'bad' avatar. The study showed comparable priming effects with human partners and good avatars (Passive priming effect: Human: 11.8%; Good Avatar: 10.9%; Figure 2), suggesting that participants attributed human-like agency to the good avatar. Indeed, when interacting with the computer-like bad avatar, the priming effect nearly disappeared (3.4%). This suggests that when interacting with a human-like avatar, sentence processing is comparable to processing in interactions with a human partner. Thus VR is a valid platform for conducting language research and studying dialogue interactions in an ecologically valid manner.

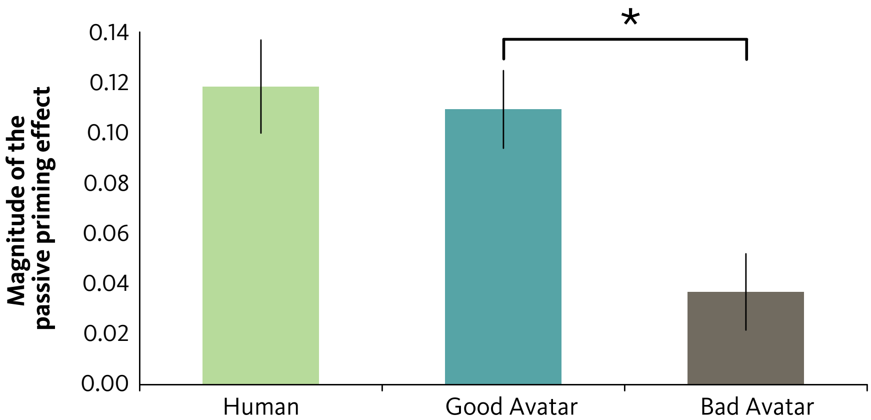
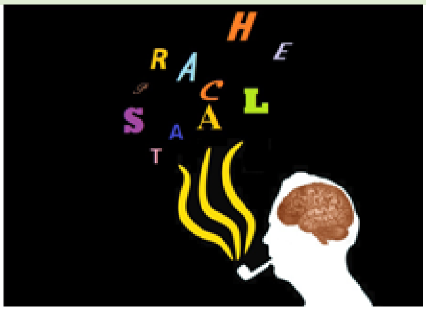


Figure 2: Participants show the same language behaviour when conversing with a human partner and with a human-like digital one. The asterisk represents the significant decrease in the priming effect when participants interacted with the bad avatar compared to the good avatar and human partner, p <.05.

Mother Of all Unification Studies (MOUS)

When making sense of written or spoken language, we combine individual words into larger units. The brain processes that facilitate this unification are an important topic of study in the Department. MOUS (Mother Of all Unification Studies) is a large-scale project investigating the neural basis of sentence processing with various



techniques. With functional magnetic resonance imaging (FMRI) and magnetoencephalography (MEG), the MOUS team measured brain activity with high spatial and temporal resolution, respectively, in 200 participants reading or listening to sentences. In addition, the team collected anatomical brain scans and genetic samples. The goal is to combine data from different modalities to obtain a more complete picture than is possible with a single-modality study. Another goal is to quantify variability across individuals and to link this variability to genetic factors in collaboration with the Language and Genetics Department. The first phase of the project focused on collection and quality assurance of the data. With all data now collected, the focus has shifted to analysis.

As an example of the initial results, Uddén, Hultén, Schoffelen and colleagues combined brain activity measurements collected separately during reading and listening. Based on fMRI brain activity, they identified a network of brain regions involving parts of the frontal, temporal and parietal lobes that was commonly activated during reading and listening. Activity in this network increased as sentences unfolded, suggesting that the visual and auditory processing streams converge onto a brain network involved in the more abstract unification process. The MEG results showed this common activation as early as 250 milliseconds after the beginning of a new word. This activation was bilateral in the left and right temporal and inferior frontal cortex (Figure 3).

Language changes music perception

When we listen to music, do we use resources that are otherwise involved in processing language? Apparently so. For example, hearing an unexpected chord – which taxes music resources – increases the processing problems observed when encountering a syntactically unexpected word in a garden-path sentence like “The attorney advised the defendant was unreliable”. Apparently, having taxed common resources through concurrent processing of a musical chord, the language processor has less left to work with when encountering syntactic challenges. What are common music-language resources actually doing? Difficult to say. One school of thought characterizes them as general attention resources. In support of this claim, it has been shown that an unexpected chord doesn’t just pose problems for linguistic syntactic processing but also for various other areas of performance: visual perception, number sequence processing, Stroop interference, and so on. Another school of thought has hypothesized that music-language resources are specific to syntax. In this view, music and language are linear sequences with combinatorial principles relating elements - tones/chords or words - to each other. This commonality is thought to be reflected

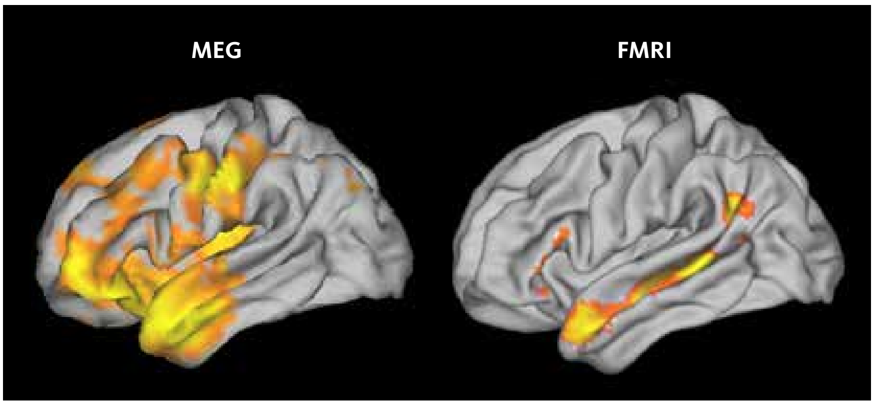


Figure 3: Neural activation common to reading and listening to sentences, as revealed with MEG (left) and FMRI (right).