Our ability to recognise letters could be hard-wired into our brains

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Credit: AI-generated image (disclaimer)

Back in the 1960s, the linguist and political activist Noam Chomsky claimed that the human brain is hardwired with an innate understanding of language. This became known as the Universal Grammar theory, and was offered as an explanation of the speed at which children tend to learn their first language. Genetically, the human mind is predisposed to

making sense of words and arranging them in a logical sequence as we overcome the initial disorder of learning a language.

Of course, not everybody agreed with Chomsky's linguistic theory, just as not everybody agrees with the political positions that he has latterly become better known for. One psychologist, Herbert Terrace, went so far in his opposition to Chomsky's ideas that he conducted an experiment in which he tried to teach American Sign Language to a chimpanzee. In a play on words, he even named his enforced research participant Nim Chimpsky.

But new research suggesting a link between written language and something more fundamental in our brains could mean we need to look again at Chomsky's ideas. The study, published in the journal *Royal Society Open Science*, found that participants could guess what sounds were represented by letters from unfamiliar alphabets at rates better than you would expect from simple chance. If we have an innate ability to understand writing, then perhaps language more generally is something found much deeper in brains than other learned skills.

The new research considers how our minds work when we try to decipher the composition of sound, according to letters, like when we work out the difference between Chomsky and Chimpsky. What is that causes us to associate the letter K with the sharp sound it represents? Is it because of the physical shape where sharp points protrude from a straight and upright stem? Does that visual representation touch upon something hardwired into our memories on a par with universal grammar ? Or, on the other hand, is this just how we are taught to interpret the letter K?

Neuroscientist Nora Turoman in Switzerland and experimental psychologist Suzy Styles in Singapore carried out a series of experiments to try to understand what makes letters look the way they do, and what

shapes human understanding about the sounds they represent. The experiments involved showing individual letters from ancient writing systems to a research sample of 98 Singaporean university students and a larger group of 300 international internet users.

In both situations, the participants were shown unfamiliar letters from a diverse range of up to 56 alphabets, representing the sounds of /i/ (the "ee" sound in "feet"), and /u/ (the "oo" sound in "shoe"). Their task was then to guess which of the letters represented the two sounds and report this back to the researchers.

Initial findings from the research suggest that there is indeed a relationship between written shapes and the sounds they represent. When presented with a pair of unfamiliar letters, the readers could guess which was which at rates higher than expected by chance. This suggests that some characteristics of linguistic sounds can be extracted from individual letter shapes by something other than prior learning or experience.

Some may argue that the readers might just be drawing upon a set of physical properties common across all languages. But that would only be the case if the physical properties of all alphabets were the same, and they are not. Japanese, for example, is very different to Arabic or Latin. It seems then that something is happening at a much deeper level in our brains when we decipher the sounds of individual letters.

The researchers believe that basic properties of our senses are involved in matching speech sounds and the shapes deemed to represent them. In particular, they think there may be a link between how detailed a letter is in terms of how much ink is used to write it, and the pitch of the associated sound. In their experiments, the more detailed a letter was, the more likely participants were to guess that it represented the lower-pitched /u/ sound.

Why is this important?

A single study isn't definitive proof, of course, and we'd need more research to really find out. But it does suggest that, in the same vein as Chomsky's theory of universal grammar, associations between linguistic sounds and visual features could be hardwired into the human brain. This makes the study significant for several reasons. First, it makes an important contribution to the fields of psycholinguistics (the relationship between language and psychological processes) and understanding how we acquire languages, for both native and non-native learners of languages.

Second, it could lead to new ways of understanding and teaching literacy by giving readers a better understanding of how speech sounds and written letters are linked. This could be particularly helpful to those who have difficulties with deciphering individual letters within words.

Finally, the research could have an impact on the way that rare languages that are mainly spoken are finally recorded in written versions. Understanding the visual properties of speech sounds could help develop new writing systems that more closely represent the spoken language.

If the human brain is indeed hardwired to particular ways of decoding words themselves, and not just their grammatical order, then the power of individual letters could be far greater than we had ever imagined. This study has given us a whole new way of looking at Chimpsky and Chomsky, and the associations we have not just with names but the letters that give them shape.

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