

# Brain's involvement in processing depends on language's graphic symbols

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Readers whose mother tongue is Arabic have more challenges reading in Arabic than native Hebrew or English speakers have reading their native languages, because the two halves of the brain divide the labor differently when the brain processes Arabic than when it processes Hebrew or English. That is the result of a new study conducted by two University of Haifa researchers, Dr. Raphiq Ibrahim of the Edmond J. Safra Brain Research Center for the Study of Learning Disabilities and the Learning Disabilities Department, and Prof. Zohar Eviatar of the Department of Psychology.

"It emerges that the contribution of the two halves of the [brain](#) to processing [written language](#) depends on the graphic and [linguistic structure](#) of these languages," noted Dr. Ibrahim.

The two halves of the brain, called hemispheres, govern different types of activities: The right hemisphere specializes more in processing [spatial tasks](#) and the holistic (pattern) processing of messages, while the [left hemisphere](#) is responsible for processing verbal messages and local processing of messages.

In order to examine the interaction between the two hemispheres while reading Hebrew, English and Arabic, two experiments were conducted with subjects divided into three groups: those with Arabic as their [mother tongue](#), those with English as their mother tongue and those with Hebrew as their mother tongue. Each group was tested in their [native language](#).

In the first experiment, words and pseudowords (strings of letters that have no [literal meaning](#)) were presented on a screen, and the subjects were asked to figure out whether the stimulus was a real word; their response time, accuracy, and sensitivity were measured with every key pressed.

In the second experiment, the subjects were presented with various words on the right or the left side of the screen, which directs the information to be processed by the opposite hemisphere (i.e., when the proper or nonsense word is screened on the right side of the screen, it will be processed by the left side of the brain, and vice versa, a stage called "unilateral"). The various words were then shown on both sides of the screen, while under the target word there was a symbol that indicated that this was the word that they should treat, while the other stimulus appeared on the other side of the screen in order to distract the brain processing (this stage is called "bilateral").

A comparison of both experiments establishes the degree of interaction between the two hemispheres during the brain's processing of the language being checked.

The results show that for readers of Hebrew and English, both hemispheres of the brain are independently involved in the task of reading, such that neither side is dependent on the other. By contrast, for the Arabic readers, it emerged that the right hemisphere was not able to function independently in the reading assignments without using the resources of the left hemisphere.

According to Dr. Ibrahim, the significance of the findings is that despite the similarities between Arabic and Hebrew, when reading the former the right brain can't function independently and the cognitive burden becomes especially heavy, making it more difficult to read the language, even for those whose mother tongue is Arabic.

"This proves that the Arabic language doesn't behave like other languages when it comes to anything connected with decoding its graphic symbols," said Dr. Ibrahim.

"The study's results show once again that on the word reading level the structural shape of Arabic orthography, that is, the graphic contours of the written language, activates the cognitive system differently. Thus, the question is again raised as to whether in the modern world those who speak certain languages have an advantage over those who speak other languages; and the role of pedagogy in improving reading skills among regular readers and those having difficulty is brought once again to the fore."

**More information:** [www.behavioralandbrainfunction ...  
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Provided by University of Haifa

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