

True or false? How our brain processes negative statements

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Every day we are confronted with positive and negative statements. By combining the new, incoming information with what we already know, we are usually able to figure out if the statement is true or false. Previous research has suggested that including negative words, such as "not," in the middle of a sentence can throw off our brains and make it more difficult to understand.

Psychologists Mante S. Nieuwland and Gina R. Kuperberg from Tufts University investigated how different types of negative statements are processed in the brain. In this study, the researchers measured event related potential responses (ERPs) while participants read statements containing critical, mid-sentence words that made the statement true or false. An ERP is an electrical brain response, as measured at the scalp with electrodes, that is directly related to something that is seen or heard. ERP studies have been used to provide us with information about how language is initially processed in the brain before any noticeable behavior occurs. Previous studies have shown that when reading affirmative statements, large ERPs occur at the words which make the statement false.

In this study, participants read statements that were either pragmatically licensed or pragmatically unlicensed. Pragmatically licensed statements are informative and sound natural. For example, "In moderation, drinking red wine isn't bad for your health" is a pragmatically licensed statement. Pragmatically unlicensed statements, on the other hand, are unnatural and not helpful. An example of this type of statement would

be, "Vitamins and proteins aren't very bad for your health." This statement is unlicensed because including the negative word "aren't" implies that vitamins and proteins may be bad for your health, which we know is not true. In this case, the negative word makes the statement trivial and not very useful.

The results, reported in *Psychological Science*, a journal of the Association for Psychological Science, reveal that the way negative statements are processed in the brain depends on the structure of the sentence itself. Just as in true statements, false words elicited larger ERPs than true words in pragmatically-licensed, negative sentences. That is, there was greater brain activity when the participants came across a word which rendered the statement false. However, in the pragmatically unlicensed sentences, true and false words elicited similar ERPs.

These results indicate that negation, when it is useful and informative (as in pragmatically licensed statements), does not make it more challenging for the brain to understand the negative meaning of the statement.

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