Science Education Collection

Verbal Priming

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Overview

Source: Laboratory of Jonathan Flombaum—Johns Hopkins University

Human memory seems to work in two broad ways. Like modern computers, the human mind has explicit, or declarative, memory: ask a question, and a person gives the best answer they can. Input a query, and a computer program returns the contents of the relevant parts of its stored memory.

Humans also have a second kind of memory system, one not really typical of computers, one that experimental psychologists call implicit.

Implicit memory is a broad term that refers to the many ways past experiences influence present behavior. Pavlov's famous dogs, for example, learned to associate the sound of a bell with mealtime. Eventually, they began salivating whenever they heard a bell, even if food was not delivered.

Humans also possess implicit memory. Implicit memories, for example, are the reason it can be difficult to fall asleep in a new place; people associate their bedroom environment and their nighttime routines with sleepiness.

Implicit memory is thought to guide human behavior in a wide array of circumstances. It is the kind of memory that guides manners and social behaviors, the kind of memory that puts relevant concepts and intuitions at a person's fingertips. In many ways, implicit memory is what makes people prepared to process a new encounter in light of the past.

One way experimental psychologists investigate implicit memory is with a paradigm known as verbal priming. This video demonstrates a procedure for investigating the nature of implicit memory through verbal priming.

Procedure

1. Stimulus design

1. This experiment asks participants to make judgments about whether letter strings are English words or not.
2. First generate a list of 30 common English nouns as in **Figure 1.**
3. Randomly divide the words into three lists of 10 words each as in **Figure 1.**

Word Stimuli for Verbal Priming

Prime Words	New Words	Words for Scrambling
CAR	TEA	KNIFE
DOOR	DRILL	BUTTER
WOOD	FLAME	BOOK
HOUSE	PLANE	TABLE
JELLY	BIRD	SAW
BOWL	CAT	NAIL
SPOON	DEER	RACK
DOUGH	SHELF	GAME
APPLE	SUGAR	BLANKET
HAMMER	WHEEL	PILL

Figure 1: 30 words for a verbal priming experiment. The 30 words are divided into 10 separate lists, one to use as prime words, one to use as new test words, and one to scramble in order to create non-words.

4. Make a list of 10 non-words using one of the three lists as a base. Randomly reorder the letters in each of the ten words to produce strings that are not English words, as in **Figure 2**.

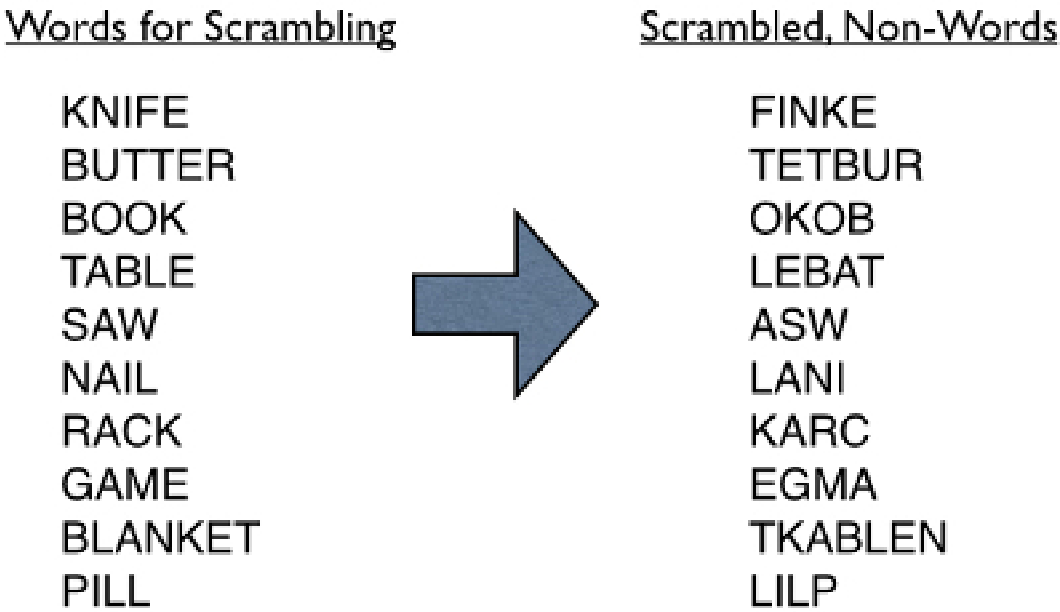

Figure 2: Generating scrambled, non-words. The non-words are created from ten of the original words.

5. Set aside one set of ten words to use as "New Words" in the test phase of the experiment, and use the remaining ten words as the "Prime Words."

2. Procedure

1. The experiment includes two short phases. The first is the "Exposure" phase, and the second is the "Test" phase.
2. Tell the participant that this is a linguistic study that will use speeded responses in different tasks to understand how people learn to read and spell.
3. In the first part of the experiment, the 'Exposure' phase, present the participant with each of the Prime Words once, centred on the screen for 500 ms.
    1. Participant's task is to use a key press to indicate whether the word they saw is more likely to be found indoors or outdoors. See **Figure 3**

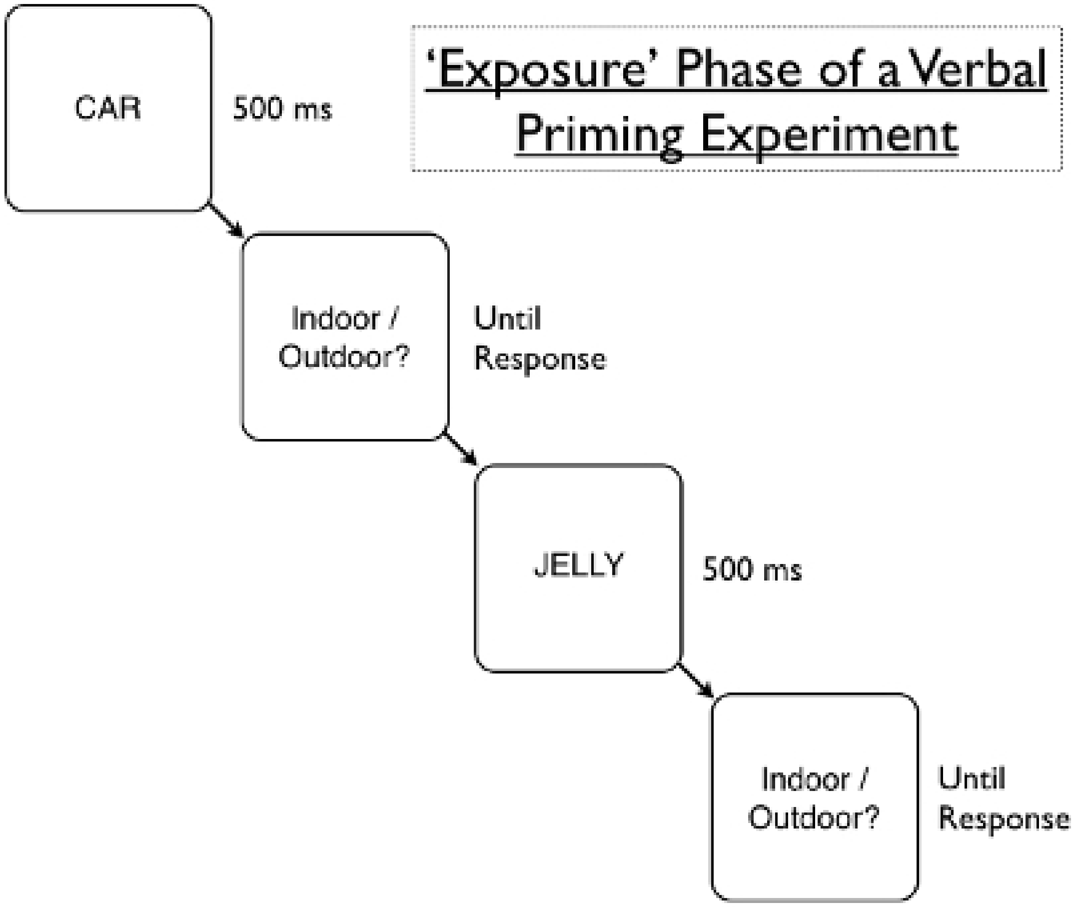

Figure 3: Exposure phase of a verbal priming experiment. On each trial, a word is shown, and the observer’s task is to judge the word as more likely to be shown indoors or outdoors..

1. This is a “cover task,” included in order to expose participants to the Prime Words without directly asking them to encode the words into memory.

4. The second part of the experiment is the ‘Test’ phase. Each trial will include one of the words or non-words from one of the three lists. Present the words intermixed and in a random order. The participant’s task is to judge whether the letter string on each trial is a word or a non-word, using a keypress to indicate the choice. See **Figure 4**.

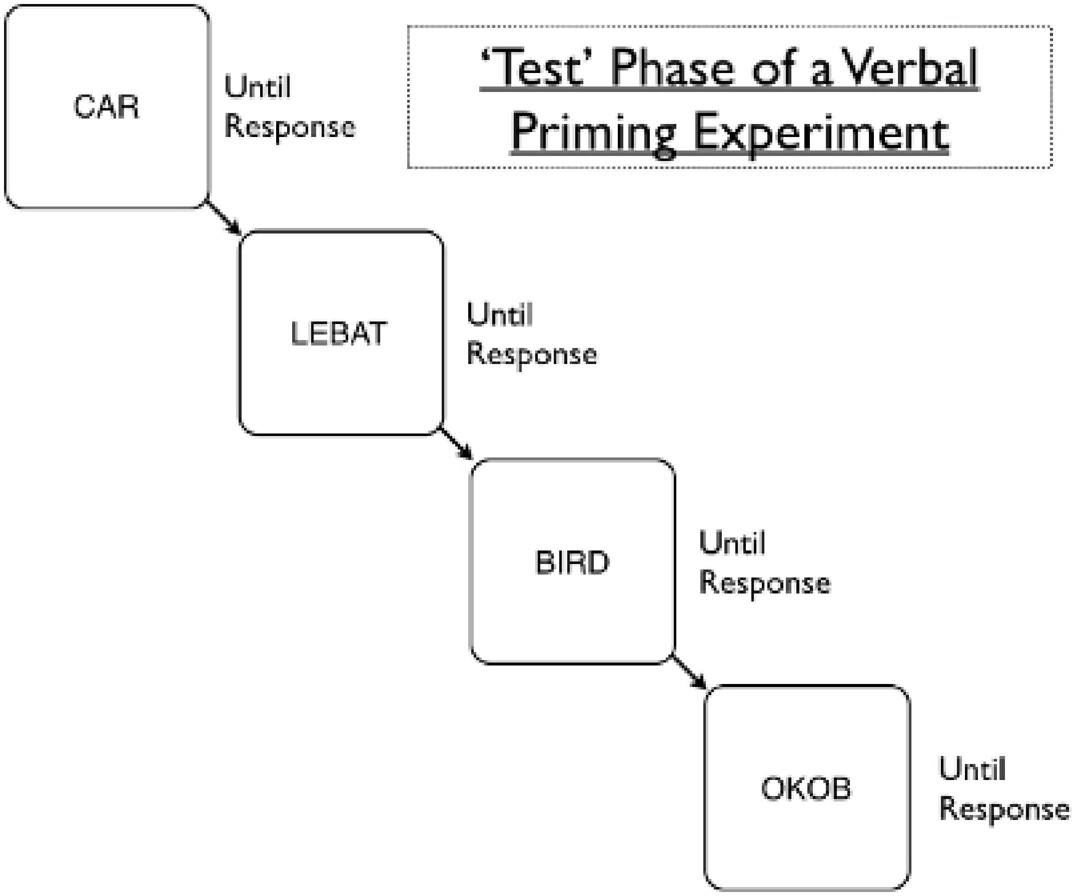

Figure 4: Test phase of a verbal priming experiment. On each trial, a word is shown, and the observer's task is to judge whether the string is a word or a non-word.

5. Emphasize to the participant that they should go as fast as possible without sacrificing accuracy. The dependent variable is reaction time, or latency —how much time elapses from the appearance of each test phase word to the participant making an accurate response.

Results

In general, people take a relatively long time to judge letter strings as non-words. So responses to non-words are longer on average than responses to words.

The crucial result, however, is in the comparison between "New Words" and "Prime Words": people respond more quickly, on average, to "Prime Words."

Recall that the "Prime Words" were the ones that appeared in the "Exposure" phase. But the participant was not asked to remember those words at that point, only to judge them as likely to be found indoors or outdoors. In the "Test" phase, participants were not asked if they had seen any of the words before, only whether a string constituted an English word or not. Why would responses to the "Prime Words" be faster than responses to the "New Words" then? When shown incidentally during the "Exposure" phase, those words became encoded into implicit memory. Their mental representations were primed. And so when a word/non-word judgment needed to be made, the participant had faster access to those words, speeding up their responses.

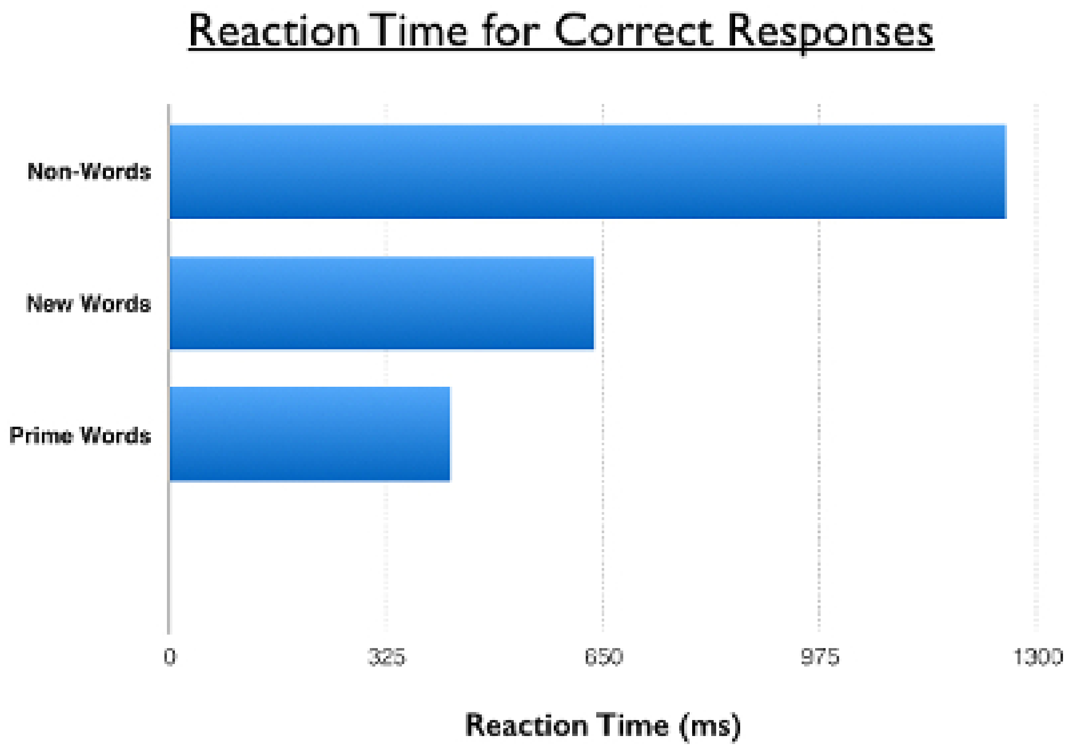

Figure 5: Reaction time for correct responses. The participant responded to “Prime Words”—words that appeared in the “Exposure” phase—more quickly than they did to “New Words.”

Applications and Summary

One place in which implicit memory and priming have long drawn interest is in marketing and advertising. Why do companies like Coca-Cola or McDonalds advertise all the time? Hasn’t everyone heard of them by now? One reason is that they want to prime the public’s memory, to have their brands on people’s minds without people necessarily knowing it. From their perspective, the advertising is worth it if the target audience and their products cross paths coincidentally and priming pushes the audience’s behavior in their direction.

By automatically forming associations to what a person already knows, priming is also thought to play an important role in the ability to comprehend new information and subjects. It is therefore important for researchers to investigate conditions that may impair priming and reduce aptitude. For example, recent research suggests weakened verbal priming as a result of drug abuse, a fact that may account for some of the known cognitive impairments drug use can cause.

Implicit memory is important in trauma and post-traumatic stress. Objects, sounds, and smells in the environment during a traumatic experience can become triggers for stress, anxiety, and even delusion through implicit association with the traumatic experience.

Finally, implicit memory, and priming, in particular, has been an area of interest in studies of memory loss in disorders such as Alzheimer’s. Many types of brain damage seem to impair explicit memory, but not implicit memory. One of the most famous examples of this comes from a patient known as E.P. E.P. suffered from herpes encephalitis, a condition in which the herpes virus enters the brain and causes extensive neural damage. E.P.’s disease destroyed a considerable amount of his medial temporal lobe, an area known to be crucial for the formation of new memories. In E.P, this produced severe anterograde amnesia. However, in a surprising experiment, researchers could show that implicit memory remained intact. When asked explicitly whether he had seen one of the exposure words, E.P. could not remember. Yet he showed faster responses to those words in the priming task, just like control participants.