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Metaphor Influence on Perception of Ambiguous Stimuli

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The Study

In attempting to unravel the mysteries of thought, psychologists have come up with various theories modeling the process of cognition. As the years go on, many of those theories have been built upon the improved capabilities of technology. The ability to view brain activity has revealed that thinking about an action, say, picking up a pencil, involves much the same mental processes as physically experiencing the movement (Bergen, Lindsay, Matlock, & Narayanan 2007). The theory of embodied cognition views thoughts as grounded in our physical experiences (see Wilson 2002 for review). Think about sitting in a chair, and your mind simulates the act of sitting, from the movement of your body to the placement of the chair in relation to you. Listen to a sentence involving motion away from you, at the same time respond faster to an image of movement toward you than one going away – the part of your brain which might process the spatial information associated with 'something going away' is already occupied thinking of the object in the sentence, interfering with your response to the image (Kaschak, Madden, Therriault, Yaxley, Aveyard, Blanchard, & Zwaan 2005). Assuming that cognitive activities involve the same mental processes as physical activities, how, then, is it possible to think about abstract concepts that have no physical expression? You cannot touch or taste an idea – but not unheard of to metaphorically say that you can hold onto it. Such common phrases in language can provide clues not only to how we speak, but how we think.

Physical domains may not merely represent themselves in the mind, but may also model abstract concepts. Although many ideas do not have physical connections in and of themselves, they are often spoken and thought of in relation to more concrete objects and properties. People often think of time, for example, in terms of space. As far as distances are concerned, the two are interchangeable. When asked how far away a certain restaurant may be, ten minutes and two miles are equally valid answers, despite the fact that one is concrete and the other abstract. The association between space and time extends beyond language. We think of time in terms of space. Say that someone tells you that the meeting scheduled for Wednesday has been moved forward two days. If you think of time as moving past you, you'll assume that the meeting is now on Monday. If you think of yourself and the meeting as moving through time, you'll think that the new meeting date is Friday. Which answer you give, when asked what day the meeting has been moved to, depends on your perspective on time. That perspective can change without your realizing it, as Boroditsky and Ramscar (2002) found when they asked that one simple question of people who had been moving, as in a lunch line or on a train, versus those who hadn't recently been moving through space. The people who traveled were more likely to say that they moved through time and the meeting was now on Friday. The physical experience of moving through space affected how they thought of the abstract concept time.

Time as space is not the only conceptual metaphor. Other abstractions are also understood via space; respect, quantity, and emotion, among others, many of which tie good things to the upward direction and express bad or unpleasant things downward. In this paper, we focus on the

concepts of “Happy” and “Sad.” Common phrases such as “high spirits” and “feeling down” illustrate the placement of emotions along a vertical axis, as do a number of studies. Meier and Robinson (2004) found more than linguistic evidence for the association by demonstrating that people judge words presented higher on a screen as more positive than those presented closer to the bottom.

While studies have shown that the upward direction creates positive associations, little research has been done on the converse. If the direction UP brings to mind happiness, does happiness make you think of the direction UP? The hypothesis of my study is that the conceptual link between happiness and UP goes both ways. Just as participants primed with upward objects judge them to be more positive, I expect participants primed with happiness to be more likely to perceive stimuli as upward, since the concept HAPPY, and consequently, the associated UP, have already been activated. In order to test the idea, participants will be presented with sentences involving HAPPY or SAD, then shown images which could be seen as going up or going down, leaving the perception of the ambiguous stimuli to be influenced by the priming of the metaphor. If happiness brings to mind the upward direction, then that direction will already be in the participant’s mind when they are shown the picture. Thus, we expect the results to show that HAPPY sentences precede UP image judgments, the converse holding true for sadness and down. If the data support this hypothesis, then metaphors will be shown to have an even greater influence on cognition than previously thought.

The Process

Before making any such claims, however, the study must be completed and the data analyzed. At present, literature reviews have been gathered, IRB approval gained, stimuli created, survey compiled and administered as a pilot study to a few participants prior to activating it. As daunting as that list may seem, the process itself was even more so.

As a student, accustomed to absorbing information from class lectures and textbook readings, it’s easy to forget that science is as much the process as the results. The goal is knowledge, certainly, in the form of data and results, but experiments exist in order to test theories, which must always be subject to discussion and replacement, never pronounced “complete”. The process, the never-ending pursuit of some explanation that makes sense of all the observations, is everything. To that end, I’ve spent this summer learning as much about the skills and processes involved in conducting research as the topic of cognition itself. Every week or so my mentor Dr. Sell and I either met or exchanged emails, through which she pointed me to new articles and taught me the thousand little considerations involved in properly designing a psycholinguistic experiment.

There is always a question to start with: As self-evident as thought seems, do we really know how it works? There is no omniscient textbook to consult beyond a certain point. Here Dr. Sell suggested articles to review, resulting in a good portion of the spring and summer being spent in the library, familiarizing myself with the literature, all the theories and experiments and discussions and rebuttals that various psychologists have published on the subject. As always when someone comes up with a question and tries to see if anyone else knows, there is no pat answer. This is the process of science – someone has a question that hasn’t been asked yet. They try to figure it out themselves and come up with an idea; other people test the idea for flaws and

provide their own interpretations. And so it goes, while some ideas are abandoned and others gather enough support that the discussions move on to other topics. Article upon article build on each other's results, promote a different interpretation, or exist purely to contradict the premise of another. Something of a change from textbooks, in which the information is simply given.

Among all the articles I encountered in the process of the lit review, none of them quite addressed the topic of whether or not the connections between abstract and physical concepts could influence perception as much as reaction. My study, then, would attempt to find out. Only, how? Under Dr. Sell's guidance, a simple outline was easy enough to assemble. We want the participants to respond to abstract concepts, so we write sentences involving those concepts. Read a sentence, look at a picture, answer whether the picture seems to be going up or down.

Our participants are human, however, which means the results can be thrown off by boredom and thoughts as to what the point of the experiment might be and a thousand other factors. The two concerns mentioned can be avoided by structuring the sentences into stories – enough connection between each sentence to keep the participants' attention and, with only the one target sentence in each story including the abstract concept, the ten filler sentences in each story prevent undue attention from being paid to the occasional mention of a story character being happy or sad.

The formation of the sentences can't be random. The results of the study will hang on the subtle effects of thinking about happiness or sadness while looking at images. In order for the results to clearly display those effects, all other variables must be controlled. Sentence length within stories must not vary too widely. Sentence structure must follow roughly the same pattern for each target – determiner target-adjective subject-noun verb preposition determiner noun. The target sentence must be in the same position for each story – always the eighth sentence, in our study. Of course each story must have the same number of sentences, none of which can be too complicated for participants to immediately understand without confusion. Then sentences are individually coded in a spreadsheet as filler or target, with word count calculated and copied into a and b sets for each story, one containing the word "happy" in the target sentences and one containing the word "sad".

In the midst of lit reviews and creating the experiment itself Dr. Sell and I also applied for IRB approval of the study – without which we could not gather data from the participants. I filled out as many of the forms as possible, Dr. Sell added to them and made corrections, and a few weeks later we received approval.

Procuring proper images for the study is even more complicated than creating the sentences. The study hinges on abstract metaphors influencing the perception of ambiguous stimuli, after all, so the stimuli used in the experiment must be as ambiguous as possible while controlling all extraneous variables. My first thought was to look for illusions that looked like they could be going up or down, but nothing I found was quite right. Dr. Sell, however, found a picture of a staircase without any hints as to whether the viewer was looking up the staircase from the bottom, or down the staircase from the top. Eventually I gathered a dozen other similar pictures of staircases that the viewer couldn't immediately recognize as being from above or below.

With the stimuli mostly created, I started assembling the experiment we would present to the participants. Given that this is a study conducted over summer, with few participants available on campus, we planned to administer it over the internet, through the website Mechanical Turk, which allows people to complete small tasks online for pay. In order for the experiment to be administered online, it had to be in the form of an online survey. Thankfully, the University of Kentucky already has an arrangement allowing researchers to use Qualtrics, an online survey creation site. A wonderful resource, but one which I have spent a good many hours working with, learning to utilize all the features properly.

As many factors as the creation of the sentences involved, the presentation thereof involved more. Timing, for one. We want automatic reactions to the stimuli, so all the pages of the survey have a timing question built in to automatically advance after 6 seconds, allowing the participants time to view the stimuli without stalling. The stimuli must also appear at the same place on the page, so the participant doesn't have to look for the next thing to pay attention to. All stair pictures and sentences were made into images which fit within a 3"x6" white background. The white background disappears into the white background of the display style, one of many Qualtrics provides. The background our survey wears pointedly does not feature the UK logo at the top of the page, in order to avoid having extraneous words and images disturb the results.

At this point, the survey itself is complete. Informed consent, instructions, practice trials, and demographic questions accompany the actual experiment. All four stories, consisting of eleven sentences alternating with stairs images alongside up/down questions, are arranged into blocks set to randomly display in different orders and with either happy or sad target sentences. The whole thing works. So, as a pilot study, in just the past week or so I asked a few friends to take it to catch any problems my eyes had missed. Their data will not be used in the final results, considering that all had listened to me explain my project at one point or another.

The results from those few friends clued me in to the great value of a pilot study, as Dr. Sell has pointed out. A pilot study lets you know if your stimuli don't work before you administer it to actual participants. In the experiment, there are 49 sets of sentence, image, question. Five practice trials and four stories of eleven sentences each. I had managed to find only eleven good, seemingly ambiguous pictures of stairs, so each picture appeared once per story, four times in total per participant. Unfortunately, once participants had seen each picture, they gave the same up/down answer to that picture every time they saw it afterward. So, instead of responses to 49 different trials, I effectively have responses to eleven. In addition, some of the stair images were not as ambiguous as I first thought. Every participant agreed that stair image #1 looked like it was going up. Stair image #3 received all downward responses. And so on.

I cannot gather good data until the stair stimuli are fixed. Most likely, after I have found quite a few more decent images, a task in and of itself, I will need a norming study in order to find out which of the images I find is actually ambiguous. After that is accomplished and the experimental survey itself fixed, I will be able to administer it to real participants. Gathering responses should not take more than a few days, using Mechanical Turk, so I'll be able to move quickly to analyzing the data this fall in order to determine whether this experiment supports my

hypothesis or not.

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