Language and Thought

weekly_readings #week-8 #my-notes-755

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> Taken from the Reading: Language and Thought.pdf

Language and Communication

> We want to understand **how language is used in thinking**. The psychology of **language as communication** is a great place to start because language seems to be a uniquely human behaviour. And it is plausible that our use of *language in thinking arose from our much earlier and more primitive use of language as communication*.

Communication in Animals and how is it different from thinking and using language

1. **Honey Bees:**
   - They rely on a system of dances and wiggles to communicate the location of nectar to other bees in the colony (Frisch, 1967). When a honeybee returns from a nectar location, it performs a dance that corresponds precisely to the direction it flew and how long it was flying.
   - **But it is not thinking**. It has little choice in terms of whether or not to do the dance. It would perform that dance even if no other bees were watching.

    - The bees are **communicating and behaving** but they **do not seem to be thinking or using language**

2. **Songbirds:**

    - They have a well-developed and highly evolved system of mating calls and warning songs. These bird songs are unique to each species and require exposure to other bird song in order to be acquired.
    - But this song has a set function related to mating and even though birds require some exposure to other birds' song, a bird can only learn its own song.

3. **African Grey parrots:**

    - Can learn to mimic human language.
    - But they are not using it to carry on a casual conversation.

4. **Dogs:**

    - They communicate with barks, growls, yelps, and the wagging of tails. They also respond to human language and non-verbal cues.
    - But they are really not able to use communication abilities to consider new ideas, solve complex problems, and tell stories.

5. **The Great Apes**, specifically *bonobos* and *orangutans*,

    - are known to be able to learn complex symbol systems.
    - But they are not spontaneously using language to direct their behaviours in the way that humans can.

Human Language is remarkable and unique

- Non-human communication and "language-like behaviour" are used primarily to engage in direct communication or as a response to external stimuli.
- Non-human language-like behaviour is not tied to thinking in the way that human language is.

In this way, human language is remarkable and unique.

Do we think in Language?

This question is trivial and nearly unanswerable.

- On the one hand, of course **we think in something like a natural language**.
    - We plan what we are going to say, we ruminate over things that have been said to us, we consider alternatives, we plan actions and think about how those actions will affect things around us.
    - Most of this kind of thinking takes place in explicit conscious awareness with a heavy reliance on an "inner voice" (a part of the working memory).

- On the other hand, many of our actions and behaviours are influenced by non-conscious computations, and are the result of System 1 thought (Evans, 2003, 2008; Evans & Stanovich, 2013).
    - Rapid, intuitive decisions are made without much or indeed any influence by the inner voice.

Dual-system approach (also known as the *default-interventionist approach*) is built on the idea that:

- **non-conscious** or **intuitive processes** drive many **thinking behaviours**,
- and these often need to be overridden by **conscious, linguistically influenced thought**.

What is Language ?

Language is a uniquely human endeavour.

13 Characteristics of Human Language (Charles Hocket, 1960)

- These are all features of human language that suggest a unique and highly evolved system designed for communication with others and also with the self (e.g., thinking)
- The 13 Design Features:
    1. Vocal/Auditory Channel
    2. Broadcast Transmission / Directional Reception
    3. Rapid Fading, transitoriness
    4. Interchangeability
    5. Total Feedback
    6. Specialization
    7. Semanticity
    8. Arbitrariness
    9. Discreteness
    10. Displacement
    11. Productivity
    12. Traditional Transmission
    13. Duality of Patterning

Language and Cognition

Language is a remarkably **complex set of behaviours**. At its core, the challenge of understanding language as a cognitive behaviour is trying to understand how humans are able to produce language such that an idea or thought can be converted into speech sounds that can then be perceived by another person and converted back into an idea. Communicative language is essentially a "**thought transmission system**".

The **linguistic duality** between **"ideas"** and **"how they are expressed"** is often described as a relationship between the **surface structure** of communication and the **deep structure**.

- *Surface structure* refers to the words that are used, spoken sounds, phrases, word order, grammar, written letters, etc. The surface structure is what we produce when we speak and what we perceive when we hear.
- *Deep structure*, on the other hand, refers to the underlying meaning and semantics of a linguistic entity.
  - These are the thoughts or ideas that you **wish to convey** via some surface structure.
  - These are the thoughts or ideas that you **try to perceive** via that surface structure

The problem of Comprehension (Ambiguity)

> A direct correspondence between surface and deep structure is often elusive

- **Same deep structure can be expressed in different surface structures:**
  - *The movie is interesting*
    This is an interesting movie
- **Same surface structure can be interpreted in multiple deep structure meanings:**
  - *The Ruler asked the police to stop drinking*
    (the police should himself stop drinking? OR He should stop people from drinking in general)
  - *Visiting Professors are interesting.*
- **Surface structure may lead to wrong deep structure (Garden-Path Sentences):**
  - *The horse raced past the barn fell* (Bever, 1970).
  - The sentence is gramatically correct. But when most people read it, it does not make sense, or makes sense right up to the word "barn".

Explanation for the Garden-Path sentence:

- The explanation is that as we hear a sentence, we construct a mental model of the idea.
- Various theories have referred to this as (1) or (2):
  1. **serial sentence parsing (Frazier & Rayner, 1982)**
     - The serial model, also known as the garden path model, assumes that we use our **knowledge of grammar** to construct a “sentence tree” mental model of the sentence as we hear the words. If a word does not fit into the conceptual tree, then we may need to construct a new model.
  2. **constraint satisfaction theory (MacDonald et al., 1994)**.
     - Suggests that we use our knowledge of **what words and ideas co-occur and follow each other** in order to arrive at a comprehension. If the more probable interpretation is not the correct one, as in a garden path sentence, then this model also predicts some confusion.

- In both theories, the *central issue* is that the **representations are constructed as we hear them**.
  - As soon as you hear "*The horse raced*" you construct a mental model of a horse that was racing. You also generate an expectation or inference that something might come after.
  - When you hear "*past*" you generate a prediction that the horse raced past a thing,
  - which turns out to be the "*barn*". It is a complete idea.
  - When you hear the word "*fell*" it does not fit with the semantics or the syntactic structure that you created.
- However, this sentence is grammatically correct, and it does have a proper interpretation. It works within a specific context.
  - *Suppose that you are going to evaluate some horses. You ask the person at the stable to race the horses to see how well they run. The horse that was raced past the house did fine, but the horse raced past the barn fell.*
  - In this context, the garden path sentence makes sense.

Linguistic Inferences

Very often we have to rely on **inferences**, **context**, and our **own semantic memory** in order to deal with ambiguity and understand the deep structure.

- For example, in the United States a very popular news outlet, the Fox News Network whenaunched in the early 2000s, its original slogan was "*Fair and Balanced News*".
  - One possible inference is that if Fox News is “fair and balanced”, then perhaps its competitors are unfair and unbalanced. It may not explicitly say that, but it may not hurt Fox News's reputation if you make that inference on your own.
- "*War in Iraq*" and "*War on Iraq*"
  - In the United States, media referred to this as the War in Iraq. In Canada, the newscasters were referring to it as the War on Iraq. That single letter change from “in” to “on” makes an incredible difference.
  - In the former case, it forces an inference that the US is fighting a war against an enemy that just happens to be in Iraq. The war is not against the country of Iraq or ordinary Iraqis, and indeed you might be helping Iraqis fight a war that they wanted to fight anyway. It was promoted by the US as part of the larger War on Terror.
  - The Canadian government did not support this war, and the news outlets referred to it as the "War on Iraq", suggesting that the United States had essentially declared war on another sovereign country.

Effect on Memory

The interaction between thought and language is complex, and many studies have shown that language use affects the structure and nature of mental representations and the output of many thinking behaviours.

Eyewitness Testimony Research (Loftus & Palmer, 1974)

- **Objective:** To investigate how memory can be manipulated and affected by the questions that are being asked..
- **Study:** Subjects were shown videos of car accidents. It showed a clip depicting two cars intersecting on a city street.
- **Test:** They were asked to estimate **how fast the cars were going** when they *intersected*.
  - But they did not use the word "intersecting".
  - Instead, one of the five words: "collided", "smashed", "bumped", "hit", "contracted"
  - (Same question asked to all, but with different verbs)
- **Observations:**
  - Participants who were asked with the verb "smashed" estimated higher speeds than those who were asked with "bumped" or "hit"
- **Interpretation:**
  - Since all participants watched the same video, and language manipulation did not occur until afterwards.
  - So the initial encoding of memory should have been the same.
  - But during retrieval, the language in the question changed their estimate.

Experiment 2 on Eye-witness testimony (Loftus & Palmer, 1974)

- **Study:**
  - 150 participants saw a 1 minute clip of car accidents.
- **Test:**
  - A week later, subjects were divided into 3 groups - "smashed", "hit", "collided"
  - And asked if they remembered any "broken glass".
  - There was no broken glass in the actual video.
- **Observations:**
  - Subjects who were asked to estimate speed with the term smashed were significantly more likely to *falsely remember broken glass*
  - Response (Y | N): Smashed(16 | 34), Hit(7 | 43), Collided (6 | 44)
- **Conclusions:**
  - The memories may have been forever tainted by that initial questions.
  - In other words, in this example, language is clearly having an effect on the mental representations that are being used to answer the questions later on.

Analogy and Metaphor

Analogy: uses language to relate concepts thay have similar deep structure having different surface structure.
Mataphor: a way of conceiving one thing in terms of another. They aid understand but can constaint thought.

> **Example** from the movie *Shrek*:
>
> Shrek is trying to explain to Donkey why ogres are complex and difficult to understand. He says “ogres are like onions” and then later explains that “We both have layers”. Donkey initially misunderstands and focusses on the surface similarity and the perceptual qualities of onions. Donkey wonders if ogres are like onions because they smell bad or they make people cry.

Conceptual Metaphor

The linguist *George Lakoff* has suggested that conceptual metaphors play a big role in how a society thinks of itself, and in politics (*Lakoff, 1987*; *Lakoff & Johnson, 1980*)

Many of the expressions we use are related to abstract metaphors in the mind.

Examples:

- Time as Money
  - This app will **save** you hours.
  - You are **spending** a lot of time on this problem.
  - This silly mistake **cost** me whole day.
- Life as a journey
  - I am **tired** of this life.
  - He is nearing **the end** of his life.
  - Our relatives and friends are **fellow-travellers**.
- Argument as War
  - Your claim is **indefensible**.
  - We **destroyed** his arguments.
  - She **won** the argument.

Metaphors' Effect on Behaviour

Sometimes metaphors can show real measurable differences in terms of behaviour.

Kempton 1986

- **Objective:** To investigate the real-world consequences of a metaphor.
- **Background:**
  - He used the example of residential thermostats, which is a **temperature-sensitive controller** for home heating and cooling. He reasoned that home heating systems are relatively simple and are familiar to most people living in a climate with a distinct summer and winter.
  - Kempton pointed out that many people must have some understanding of how the thermostat works because they typically have to adjust them several times a day or at least several times a week.
  - Kempton argued that there are broadly defined metaphors or folk theories for how the thermostat works.

1. **Feedback Theory:** (Switch Metaphor) - suggests that the thermostat senses the temperature and turns the furnace on or off to maintain that set temperature.
2. **Valve Theory:** (Accelerator Metaphor) - holds that the thermostat actually controls the amount of heat coming out – like a valve. A higher setting releases higher heat.

- Only one of these theories is correct (The Feedback Theory).

- **Observations:**
  - Kempton observed that **both of these theories were present**, and that these theories had an **effect on actual thermostat adjustment behaviour**.
  - People who seemed to rely on the "valve theory" tended to make more adjustments in general and also more extreme adjustments than people who relied on the "feedback theory".

Universal Cognitive Metaphor

- Others have suggested that **across many languages and cultures** there seem to exist universal cognitive metaphors.
- In many cases, these reflect a **conceptual similarity** between a **physical thing** and a **psychological concept**.
  - For example, there are many metaphors that relate to the idea of **happiness being "up"**. People can be said to be upbeat when happy or feeling down if they are not happy.
  - Other examples reflect the idea that **consciousness is "up"**. You wake up, you go down for a nap, etc.
  - Another common metaphor is that **control is like being above something**. You can be on top of the situation, you are in charge of people who work under you.
- These cognitive metaphors are common in English, but they are common in many other languages as well. This suggests that there is a universality to these metaphors, and a commonality among cultures between language and thought.

Language and Thought

> The discussions above illustrate many of the ways in which language influences how you remember things, how you think about things, and how you make decisions. In short, it is clear that language and linguistic context have an effect on thinking.
>
> - One version of this general claim is referred to as **Linguistic Relativity**.
> - The strongest form of thi claim is called **Linguistic Determinism** (also called *Sapir-Whorf hypothesis*)

Linguistic Relativity and Linguistic Determinism

Linguistic Relativity:

- suggests that our native language influences how we think and behave
- and that there will be differences among groups of people as a function of their native language.
- That is, thinking is relative. This relativity depends in part on the native language a person learned to speak.

Linguistic Determinism:

- argues that language determines thought and can even place constraints on what a person can perceive

Whorf's Bold Claim:

> *We dissect nature along lines laid down by our native language. The categories and types that we isolate from the world of phenomena we do not find there because they stare every observer in the face; on the contrary, the world is presented in a kaleidoscope flux of impressions which has to be organized by our minds – and this means largely by the linguistic systems of our minds. We cut nature up, organize it into concepts, and ascribe significances as we do, largely because we are parties to an agreement to organize it in this way – an agreement that holds throughout our speech community and is codified in the patterns of our language*
> . . .
> *all observers are not led by the same physical evidence to the same picture of the universe, unless their linguistic backgrounds are similar, or can in some way be calibrated.*
>
> (Whorf, 1956: 213–214; my emphasis)

- Whorf appears to be **challenging Plato's notion of cutting nature at the joint**s, meaning a natural way to divide the natural world and concepts.
- Rather, Whorf suggests that **concepts and categories** are **determined almost exclusively by one's native language**.

Color Cognition

This claim that "language constrains or determines perception and cognition" was a bold one, and in the middle of the twentieth century was very provocative. Anthropologists, psychologists, and linguists began to look for and examine ways to test this idea.

Berlin and Kay (1969)

- They looked at the distribution of colour terms across many different languages.
- They reasoned that if language constrains thought, then native languages may constrain the types of colours that can be perceived and used.

- In order to be considered, they looked at colours that were **monolexemic** (cannot be described in terms of any other colour terms; Eg- white, black, red, green, yellow, purple, pink, orange, grey).
  - These are called basic colour terms
    - Cannot be defined in terms of other colours.
    - Application is not restricted to a narrow class of objects (like- "blonde" for hairs)
    - Psychologically salient for all speakers ("color of my car" is not salient for everyone)
- **EVOLUTION OF COLOUR TERMS (Findings by Berlin and Kay in 1969):**
  - All languages contain terms for dark and light.
  - Red is also fairly common, and in languages with only three terms.
  - As languages evolve, more terms may be added but they still keep the terms from earlier stages.

Stage	Colours
Stage I:	Dark-cool and light-warm
Stage II:	Red
Stage III:	Either green or yellow
Stage IV:	Both green and yellow
Stage V:	Blue
Stage VI:	Brown
Stage VII:	Purple, pink, orange, or grey

- **CONTRIBUTION:**
  - Berlin and Kay's work **does not really argue completely against the linguistic determinism** hypothesis, and their initial claims have been softened and criticized (Saunders & van Brakel, 1997).
  - But their work has provided a very interesting way to test it.
    - If there are languages with only two or three words for colours, and
    - If the linguistic relativity theory is correct,
    - Then speakers of that language should have difficulty categorizing colours with the same colour name.

Eleanor Rosch Heider, 1972 ("Universals in color naming and memory")

- **Background:**
  - The Dani tribe (in Papua New Guinea) have only two words to denote colours, and thus to linguistically define colour categories. One category is called "mili" and refers to cool, dark shades, such as the English colours blue, green, and black. The second category is "mola", which refers to warmer or lighter colours, such as the English colours red, yellow, and white.
  - The colour categories for English speakers are however based around focal colours
- **Color Learning Task:**

    - Subjects to learn colours with color cards (called color chips - taken from Munsell colour system - way of describing color in terms of hue, value, chroma).
    - **Paired-associate Learning:** They were asked to learn new color names using Munsell chips. 16 color-word pairs were shown.
        - Each chip was shown for 5 sec.
        - The waited for 30 secs
        - The shown a 160-chip array and asked to select the chip seen earlier.
    - Colours can be of two types:
        - C1: Focal Colours (colours at the perceptual center of their category). They were selected as the best example of a colour category in the prior study with English speakers.
        - C2: Non-focal colours (colours at the boundary)
    - Participants were of two types:
        - P1: English speakers
        - P2: Dani People
- **Expectation:**
    - Rosch reasoned that **English speakers** would have no difficulty learning a paired associate for a focal colour because it would already activate the prototype for an existing colour category. They should perform less well on paired associate learning for non-focal colours because they would not have a linguistic label to hang on that colour.
    - If linguistic determinism is operating, then for the **Dani people**, a focal color should not activate an existing linguistic category for speakers of the Dani language, and so they should show little difference between learning the paired associates for focal colours and learning the paired associates for non-focal colours.
- **Observations:**
    - Speakers of the Dani language showed the same advantage for learning focal colours over non-focal colours that English speakers showed.
- **Interpretation**
    - This suggests that even though their language has only two words to denote colour categories, they can perceive the same differences in colours as English speakers can.
- **Conclusion:**
    - Thus, this appears to be evidence against a strong interpretation of linguistic relativity. The Dani language was not constraining the perception of its speakers
- **Further Arguments:**
    - *Colour vision is carried out computationally at the biological level. Regardless of linguistically defined categories, we all still have the same visual system with a retina filled with photoreceptors that are sensitive to different wavelengths*

Naming Common Objects

More recent work has continued to cast doubt on the linguistic determinism theory.

Barbara Malt's research (Malt et al., 1999)

- **Background:** For some artifacts that can hold some liquid or solid items,
  - North American English speakers have different names based on the size, shape, material, and utility of that artifact ("Jug", "Bottle", "Jar", "Container").
  - However, Spanish label all these things with a single term "frasco".
- **Expectation / Claim / Argument:**
  - If linguistic determinism held true for manufactured objects, Spanish speakers should show less ability to classify them into different categories based on surface similarity.
- **Observations:**
  - English-speaking and Spanish-speaking subjects **did not differ much from each other** when classifying these containers via overall similarity.
- **Interpretation:**
  - The linguistic label did not interfere with their ability to perceive and process surface features.
- **Conclusion:**
  - these results do not support the strong version of the linguistic determinism theory.

Count versus Mass Nouns

> Language also affects perception and interpretation in some cases.

For example, consider the distinction between **objects** and **substances**.

- In English, So-called **"count nouns"** refer to entities, objects, and kinds. We can say “one horse, two horses, five cats, and 13 cakes”.
- On the other hand, **"mass nouns"** typically denote entities that are not considered individually. We might say “a pile of leaves”, “a dash of salt”, or “a lot of mud”.

Study by Soja et. al (1991)

- **Objective:**
  - When we acquire the ability to tell the difference between objects and substances. Do children learn to do this through exposure to their native language?
- **Task:**
  - English Speaking 2 year olds were shown objects that were given an arbitrary name.
  - They were then asked to pick out similar objects to the one they had just been shown and given a name for.
  - *Example*:
    - "This is my blicket". "Can you show me some more blickets?"
- **Observations:**

    - In extending these words to new displays, two-year-olds showed a distinction between object and substance.
    - When the sample was a **hard-edged solid object**, they extended the new word to all objects of the **same shape**, even when made of a different material.
    - When the sample was a **non-solid substance**, they extended the word to **other-shaped puddles of that same substance** but **not to shape matches made of different materials**.
- **Interpretation & Conclusion:**
    - This suggests that the distinction may be acquired via language, because both the *object* and the *term* were new.

Linguistic Differences in Time perception

A final example of how language affects the thinking process is demonstrated in a study by Lera Boroditsky

Lera Boroditsky (2001)

- **Background:**
    - She noted that across different languages and cultures there are differences in the metaphors that people use to talk about time.
    - English Speakers: Time is Horizontal
    - Mandarin Speakers: Time is Vertical
- **Priming:**
    - Subjects were first shown a prime to orient them to the horizontal or vertical dimension.
- **Task:**
    - They were then asked to either confirm or disconfirm temporal propositions (eg: November comes before December).
- **Expectations:**
    - Boroditsky reasoned that if a prime activated a vertical metaphor, and you spoke a language that encouraged thinking about time in a vertical dimension, you should be faster in judging the temporal proposition.
- **Observations:**
    - After seeing a horizontally oriented prime, English speakers were faster to confirm or disconfirm temporal propositions compared to when they had seen the vertical prime.
    - She found the reverse effect for Mandarin speakers.
- **Conclusion:**
    - This suggests that language differences may predict aspects of temporal reasoning by speakers.
- **Subsequent Studies:**

    - Boroditsky trained English-speaking subjects to think about time vertically, giving them examples of vertical metaphors.
    - In this case, after the training, the English speakers exhibited the vertical rather than the former horizontal priming effect.
- **Contribution:**
    - This study shows a clear **impact of language on thought**
    - It is **not strong evidence for linguistic determinism** because the native language does not seem to determine how time is perceived.