To Linguistic Relativity and Beyond: An Overview of Contemporary Research and Historical Groundwork

Petrina Chan

Human Centered Design and Engineering, University of Washington, Seattle

HCDE 512: International User Experience and Communication

Dr. Manuela Noske

December 11, 2022

1. Introduction

As it has enjoyed a marked resurgence and reinvigoration in the past couple of decades, linguistic relativity has grappled with a history of controversy and pervasive difficulties that still weigh heavy on researchers today. At its core, linguistic relativity posits that language shapes the way people think; as a result, those who speak different languages may think differently, in predictable ways (Casasanto, 2016). Those familiar with linguistic relativity and its historical underpinnings, whether as a critic or proponent, may be familiar with landmark work in examining possible manifestations in mechanisms such as color, motion, time, and spatial perception. Though research in linguistic relativity spans domains, from anthropology, to behavioral psychology, to cognitive science, to linguistics, the fundamental goal of linguistic relativity research remains throughout, which is to determine whether and how language shapes thought. Does language merely reflect our conceptualizations of the world, or does it also contribute to those conceptualizations?

Most, if not all, scholars today reject the idea of outright linguistic determinism. There exists substantial evidence to confidently argue that language does not determine the basic categories of thought or that it overwrites pre existing conceptual distinctions (Wolff & Holmes, 2010). While some might also go as far as to say linguistic relativity lacks solid legs to stand on for a variety of reasons, contemporary advances in the field point toward an encouraging shift in methodology and perspectives. These advances have begun to address the persistent baggage weighing on linguistic relativity research, including issues surrounding the often circular nature of studies in the field, and the magnitude of the impact language can even have on cognition and if the effects are indeed meaningful. Furthermore, new areas of research have emerged, expanding upon more traditional conceptualizations of linguistic relativity and bringing the

theories into new domains, such as neurofunctionality and emotioncy and sensory relativism. By holistic appraisal of its history, shortcomings, achievements, and current directions, we can gain appreciation, context, and necessary knowledge for the consumption and creation of research in the area.

2. A brief history of linguistic relativity

Linguistic relativity is also commonly referred to as the Sapir-Whorf hypothesis, giving honor to two individuals, Edward Sapir and Benjamin Whorf, who most influentially proposed and shaped the theory of linguistic relativity. While this attribution is valid in giving credit to Sapir and Whorf for their pioneering work in the field, it is also a misnomer. Sapir and Whorf did not explicitly put forth a singular, unified hypothesis which we refer to today as linguistic relativity. Rather, their bodies of work and inferences have been interpreted and construed as such (Kay & Kempton, 1984; Casasanto, 2016). As stated by Eric Lennenberg and championed by Robert Brown, Whorf (who initially coined the term linguistic relativity) put forward two broad hypotheses (Kay & Kempton, 1984):

1. Structural differences between language systems will, in general, be paralleled by nonlinguistic cognitive differences, of an unspecified sort, in the native speakers of the two languages.
2. The structure of anyone's native language strongly influences or fully determines the world-view he will acquire as he learns the language.

With this in mind, a brief summation of work in linguistic relativity is vital to understanding current directions, hindrances, and commonly held beliefs and guiding principles surrounding linguistic relativity research.

2.1 Evolution of linguistic relativity

The conception of linguistic relativity is most attributed to Franz Boas and his students in the early 20th century. Most strikingly, it is essential to recognize Boas' commitment to combating ethnocentric evolutionism through his work (Kay & Kempton, 1984). As an anthropologist, Boas directly challenged the commonly held idea at the time that languages spoken by Native Americans were inferior to the better-known European languages, "arguing that the deficiencies attributed to these languages, in fact, arose from misunderstandings by investigators who, under the influence of their own language categories, failed to grasp the categories of the other language" (Lucy, 2016). He also argued that languages may differ in what they obligatorily and explicitly express, but still could convey equivalently rich substantive meanings. Both these concepts are still of high importance in work surrounding linguistic relativity today. Boas' arguably most famous work on Eskimos and their terminology of snow has notoriously come under fire, many accusing Boas of drawing conclusions and making eurocentrist claims about the observed population that he in fact never postulated, which also directly contradicts the basis of his work that combated ethnocentrism at its core. His simple observation of the complexity of terminology in Native languages, was "subsequently embellished to the point of absurdity in the literature", losing sight of the main points from the work that still guide and serve as the framework for research today:

1. Recognition of the importance of differences in linguistic classifications
2. Rejection of hierarchical rankings of languages as to their expressive and referential potential
3. Identification of the unwitting conceptual and methodological ethnocentrism underlying such hierarchical judgments. (Lucy, 2016)

Though unfortunately many studies and methodologies since have fallen victim to related crimes to ethnocentrism, such as neglecting to account for structural differences between languages, which later invalidated results, the field has now matured to a point where these follies and directions are recognized, analyzed, and reconsidered to form new, more promising lines of research.

Following Boas, Sapir, and Whorf (who were each other's mentors and students respectively) who defined the foundational period of work in linguistic relativity, a rise in psychological interest and advancement in the field set the stage for what is known as the transformational period. Prior to the transformational period, psychological research made its entrance looking at color perception, memory, and classification. However, much of this research was unfortunately riddled with holes, many caused by methodology oversights. Perhaps the most notable of these is the failure to account for differences in language structure, which was foretold by Boas. This included selecting terms from languages for comparison based on overlap with English terms, with little or no attention to their place in the overall language structure (e.g., often ignoring polysemy, morphological complexity, syntactic status, etc.), and then ranking data and results hierarchically according to how closely it approximated the researchers' native language (Lucy, 2016).

During the transformational period, new anthropological and psychological methodologies arose and in turn shifted some research focuses. On the anthropology side, neutral frameworks were being developed that respected the structural organization of each language. In psychology, the scope of research expanded beyond linguistic relativity "proper" to include extensions such as the general relationship of language and thought (semiotic relativity). These advancements set the stage for the current contemporary period.

2.3 Current tensions and areas of interest

Researchers across disciplines are still grappling with formulating sound and effective assessments that will not be later penetrated and disproved as previous research has, and the need for adequate linguistic analysis. One of the largest roadblocks in the field, and an area of attention for both critics and supporters alike, is the circular reasoning issue surrounding linguistic relativity studies. Because many studies to date in various fields (including linguistics, psycholinguistics, neurolinguistics, cognitive sciences) require or encourage conscious processing and verbalization, meaningful progress can only be made if studies are developed that cannot be construed as merely an effect of language on language. Some doubted that this problem could ever be circumvented (Casasanto, 2016). In fact, this circular conundrum is a large contributor to many skeptics' arguments. In addition to the difficulty of truly separating language from other factors such as culture and physical environment, contemporary research in linguistic relativity has no shortage of challenges to meet. This has prompted venturing into areas such as developmental psychology and neuroscience, and including new lines of inquiry such as multilingualism, while developing newer, more robust methodologies that show burgeoning promise for the field, expanding in novel ways beyond traditional linguistic relativity without falling victim to historical pitfalls.

3. Contemporary work and novel directions

Contemporary directions in linguistic relativity research have leveraged both technical and theoretical advancements to open new doors and refine the current conceptualization of linguistic relativity and what it entails.

3.1 Current conceptualizations and lines of research

To take stock of and structure our understanding of these current directions, it is helpful to outline the different hypotheses within linguistic relativity and their relationships to past and previous theories. Wolff & Holmes (2010) offers an efficient and thorough breakdown of the classes and subclasses of hypotheses on how language might affect thought (Fig. 1).

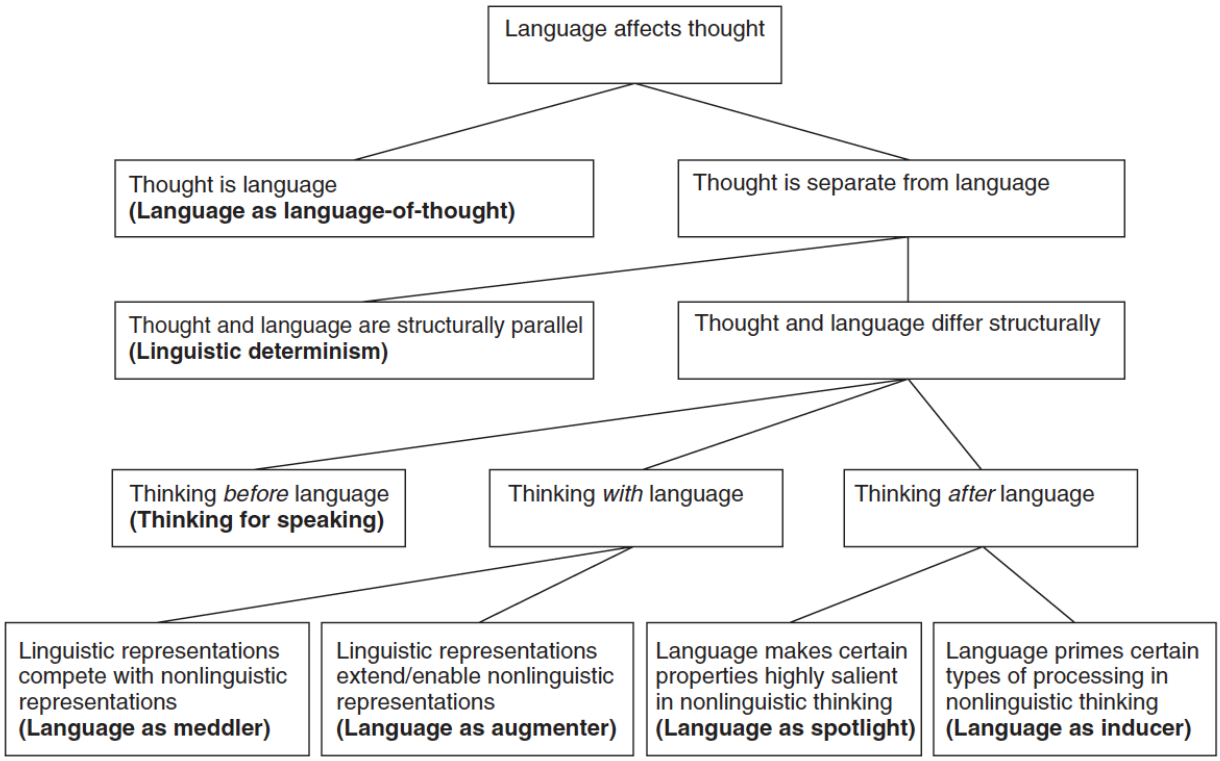

Fig. 1. Classes and subclasses of hypotheses on how language might affect though (Wolff & Holmes, 2010)

While language as language-of-thought and linguistic determinism have been largely discredited and relegated to history, the other five hypotheses still appear to have merit and are receiving active attention from researchers. For the brevity and scope of this paper, we will focus most on work relating to two of the potentially most compelling and rich hypotheses, language as meddler and language as augmenter, both nested under thinking with language. Combined with strides made in combating the circularity problem and isolating language in controlled studies,

researchers are making unprecedented progress in understanding which cognitive processes are affected by which linguistic processes under which circumstances.

Thinking with language refers to effects in which processes associated with language are activated alongside non-linguistic processes (Wolff & Holmes, 2010). They may either "meddle" with these non-linguistic processes, essentially facilitating or enhancing a non-linguistic reliant task, but still allowing the individual to complete the task while relying on either the combination or just the non-linguistic processes when the linguistic "meddler" is interfered with. Language is not needed for these functions, but nonetheless is employed and influences their operations. This has been seen in recent studies in the ever popular areas of linguistic relativity research; motion and color. In Papafragou (2008), Greek and English speakers were asked to observe motion events in which objects would follow a path. Participants were asked to either watch these events in preparation to describe them verbally or not (linguistic versus non-linguistic task). Eye-tracking was employed during the trials. During both linguistic and non-linguistic tasks, participants consistently shifted their visual attention to aspects of the scenes not typically encoded in verbs in their language at the end of the trials. This was suggested to compensate for relatively greater early attention to the typically encoded aspects. Since this occurred in non-linguistic tasks when participants did not need to put anything into words, this could be seen as a true spontaneous generation of linguistic codes that meddles with a non-linguistic process of observing motion.

Similarly, in two color perception studies by Winawer et al. (2007) and Gilbert et al. (2006), crosslinguistic differences in color memory, perception, and discrimination were eliminated when presented with verbal interference during the task. The tasks were still completed by the participants, but differences in results between language groups ceased to exist,

lending support to the hypothesis of language spontaneously meddling with cognitive tasks that otherwise do not rely on linguistic codes to fulfill task demands.

In perhaps a more extreme form, language has also been shown to enable the completion of tasks that would be otherwise impossible without specific linguistic codes, introducing "new conceptual tools" to the individual (Wolff & Holmes, 2010). Most famously, counting and enumeration of exact large quantities exemplifies this hypothesis; language as augmenter. While approximations of both small and large quantities have been shown to be innate to humans, having the ability to specify and recognize exact large amounts (greater than four) has been shown to only be possible under facilitation of learned language. Building on previous research in numbers and counting, Gordon (2004), demonstrated how the Pirahã's failure to enumerate and replicate presentation of exact large amounts of objects directly parallels their lack of exact number terminology in their language, which only has the vocabulary for approximate quantities. It is important to note that their responses were not random, but rarely ever succeeded in presenting the correct exact amount. Even more importantly, these results were replicated and confirmed by Frank et al. (2008). These observations have lent support to the idea that language might be used to reason about numbers and other concepts beyond that, essentially supporting the formation of rules and even more interestingly rules embedded in other rules.

This idea of language supporting rule formation is directly manifested in false belief studies. Evidence from developmental and crosslinguistic work offer compelling contributions in this area. The basis of the false belief task is well described by Bloom & Keil (2001):

> The researcher shows the participant (a child) a Smarties candy container and shakes the container which makes a rattling noise. The participant is asked, "What's inside?" And they inevitably reply "Smarties". Then the container is opened and it is shown that it

actually contains small pencils. They are then asked how another child who has not seen the opened container will answer when asked the same question ("What's inside?"). It is well established that English speaking children will answer by saying the next child will answer by saying the container contains Smarties starting at around age 4. When researching deaf speakers of Nicaraguan Sign Language (NSL), Pyers and Senghas (2009) studied two cohorts of NSL speakers, those who learned the first, more basic and primitive form of the language, and those who learned the newer, more complex form, which includes significantly more signs for mental states, such as "think" and "know". Apart from this difference in sign vocabulary, the cohorts were comparable in education, environment, socioeconomic status, and so forth.

Despite being younger, those in the second cohort showed significantly greater success with a modified false belief task than the first, suggesting that the capacity to represent false beliefs may depend, at least in part, on people's ability to represent and determine embedded rule structures which derives from a learned language and in turn may be influenced by the structures of the specific language. Though this evidence remains correlational, not causational, it is a large step forward in being able to separate language from culture (since both cohorts are immersed in the same culture), and showing a substantial impact of language on a specific cognitive process. Some suggest that this may even be rooted in more fundamental executive functioning abilities, which goes through a critical foundational period during preschool years. More related research in executive functioning will be discussed in the context of neurofunctional research in linguistic relativity. Others have suggested that this may also tie in to the ability to represent life experiences in narrative structures which relies on some form of learned language (Bloom & Keil, 2001). This seems to develop in parallel and during the same stage in development to

executive functioning abilities. Furthermore, this may also have a role in autobiographical memories, which have been shown to develop later in populations that wait significantly longer to involve children in everyday conversations (Bloom & Keil, 2001).

3.2 Neurofunctional research

Major advancements in neuroimaging technology have facilitated unprecedented breakthroughs in many cognitive and psychological realms including linguistic relativity. Most remarkably for the field, it has given researchers a way to directly and concretely combat the persistent circular dilemma by offering possible mechanisms to isolate language from non-linguistic perception. A pioneer in this field, Guillame Thierry and his colleagues have done groundbreaking studies on what he calls Neurolinguistic Relativity (Thierry, 2016). Their studies offer evidence that "strongly undermine the idea that language may stand apart from the rest of our cognitive make-up" from three main domains: color and object categorization, motion conceptualization, and executive function.

By utilizing various adaptations of the oddball paradigm while monitoring event related potentials (ERPs) of participants, Thierry was able to make a case for lexical distinction in a language leading to greater perceptual discrimination compared to those who lack those distinctions in their given language. An oddball paradigm is an established neurofunctional test that tests automatic and unconscious response of the brain to a detectable difference between frequent and rare stimuli. Rather than an effect of online activation of these distinctions, Thierry describes these results as evidence for a perceptual distinction established through repeated exposure. An example of the oddball paradigm as described in Thierry (2016) is below:

We presented native speakers of Greek and English with streams of simple shapes (mostly circles and, infrequently, squares) filled in light blue, dark blue, light green, or dark

green and instructed them to press a designated button when they saw a square. Participants' attention was thus drawn to shape rather than color.

In the color study, it was observed that Greek speakers (from Greece), who have different color terms for the English dark and light blue, showed a larger magnitude ERP elicitation during blue contrast trials versus green contrast trials. When compared to English speakers (from the UK), who showed no significant differences between either color trials, there was a three way interaction between participant group, color hue, and stimulus deviancy (the detectable difference between frequent and rare stimuli). The process is likely unconscious since upon debriefing, participants did not recall that circles (the non-target shape) were changing color, even though ERP deviations were observed with similar magnitude for circles as squares. This process was likely not due to online lexical processing because the ERP deviance occurred less than 200ms after the stimulus onset, which is the well established cut off for effects of lexical processing. Environmental factors, which were also of concern, were accounted for since if one were to argue that the blues presented in the Greek environment were affecting their perception of the blues in the study, one would also argue that the greens present in the UK and not in Greece would in turn affect the English speaker's results, which did not occur. Thierry and colleagues tested variations of the oddball paradigm in physical and pictorial object and scene categorization with different language speakers with similarly impactful results.

In previous studies of motion related to linguistic relativity, even those using eye-tracking, interpretation of results cannot exclude covert verbalization, leading again to the same circularity issues. Using a variant of the oddball paradigm that featured dynamic motion paths and endpoints they tested native speakers from Germany and the UK. German language is structured so that more attention is given to endpoints versus English speakers who seem to

attend equally to both trajectory and endpoint. As expected from these established differences, German speakers showed much larger ERP differences in matching endpoint trials while no difference between trials was detected in the English speakers. This motion study is particularly notable as perhaps the first of its kind to that grammatical properties of the native language affect motion event conceptualization in a systematic fashion, even when language involvement is unlikely, given the nature of the stimuli and task, and when categorization behavior is not overtly biased by the instructions (Thierry, 2016).

Finally, a study by Wu and Thierry in 2013 examined whether language context modulates executive functioning and decision making in Welsh-English bilinguals by measuring interference in an adapted version of the flanker task. In a flanker task (pictured below) participants are asked to state the direction of the center, target arrow; trials may appear as congruent with all arrows facing the same direction, or incongruent, facing different directions. (fig. 2).

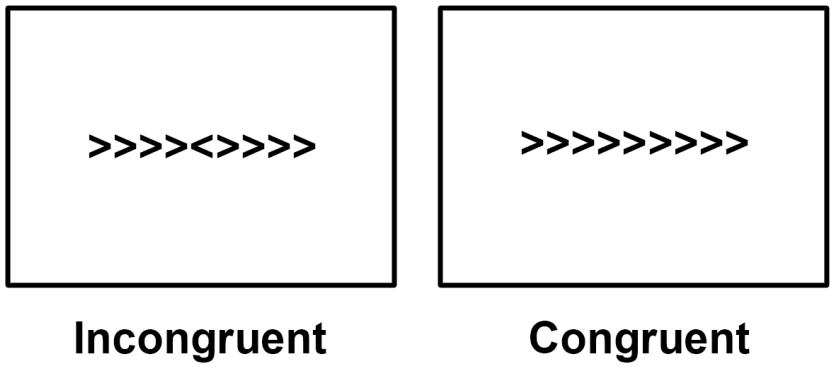

Fig. 2. Flanker task. From Andy's Brain Book.

In Wu & Thierry (2013), sometimes words in either Welsh or English or both presented instead of arrows, which participants were supposed to ignore. Participants showed better ability to manage incongruent trials through lower magnitude of interference related ERPs when words

were all in one language rather than mixed. Even though the task at hand is inherently non-linguistic, language had a direct influence on executive function and decision making. Because language has previously been found to influence cognitive and emotional processes that result in deviations in decision making, this lends even more support to the hypothesis that through modulating emotions and sensations, language may have a marked influence on decision making, which is further extended and complemented through the conception of sensory relativism (Pishghadam et al., 2015). Though neurofunctional methods in linguistic relativity research are still very novel and have yet to develop a large body of work, the existing progress shows much potential and untapped avenues for further research.

3.3 Sensory relativism

Sensory relativism, proposed by Pishghadam and colleagues, seeks to be a complementary view of relativity; bridging some of the gaps and enriching work in linguistic relativity. By extending the traditional understanding of linguistic relativity to emotional aspects of linguistics and language, it introduces that emotions, resulting from sensory experiences, can impose structure on cognition. As the details of sensory relativism are not of direct concern for the current focus on linguistic relativity, a very brief summation of its conception will be discussed along with its possible implications for the advancement of the understanding and conceptualization of linguistic determinism.

After interviewing individuals in Iran with different emociancy types (or defined experience levels ranging from never hearing of the concept to seeing, experiencing, or researching it) regarding phlebotomy (bloodletting), Pishghadam et. al were able to code and extract overarching themes and discrete indicators from each of the 5 define emotioncy levels. Those with high emotioncy levels (intimate involvement and experience) tended to use positive

language, fewer hedges, longer talk time, proximal emotions, wider vocabulary size, and more use of analogy. On the other hand, those with low emotioncy tended to use negative language, more hedges, shorter talk time, distal emotions, limited vocabulary size, more use of association.

On the surface, these results may not seem particularly intriguing. However, Pishghadam et al., presents some compelling points about the data and how it can be used to enhance and extend the work surrounding linguistic relativity. The authors relate these results to higher emotioncy, and thus more involved participants, being able to harness a more complex network of emotions and senses, which in turn allow them greater access to lexical terms and synthesis through emotional engagement. This is another mechanism through which cognition can be relativised alongside language. These findings hint at another layer beyond the sole influence of language itself that may be intertwined, emphasizing the dynamic nature of cognition, even and especially between those within the same cultural and linguistic groups. Work such as this adds some perhaps much needed nuance to the conception of linguistic relativity. Although we may be able to know meanings of words and lexical structures across languages, realities may still be drastically shaped by other mechanisms, forming different realities and understandings of the world. The theory of sensory relativism is incredibly novel and under researched, but nonetheless presents a compelling viewpoint on the complex cognitive ecosystem that linguistic relativity may inhabit. The ways in which language influences emotions and vice versa remains a fertile ground for further research in the context of linguistic relativity.

4. Conclusion

In the past century, linguistic relativity has matured drastically with contributions from across domains and disciplines. By following its evolution and acknowledging its pitfalls, merits, misconceptions, and innovations, a more comprehensive understanding of linguistic relativity

can be achieved. This level of comprehension and background knowledge is essential to both conducting and interpreting research while upholding core tenets and principles of the field, including supporting no hierarchy or inherent deficiencies between languages, but rather seeking to uncover which cognitive processes are affected by which linguistic categories under which circumstances, with no judgments of valence between languages and culture. Though this paper only covers a few essential and compelling moments and advancements in the study of linguistic relativity, it should offer a stable foundation to act as a springboard or enticing amuse-bouche for further exploration.

More researchers today are considering an expanded definition and scope of linguistic relativity, leading to a more holistic understanding of its mechanisms, manifestations, and underpinnings, and its potential places in context of a larger, incredibly nuanced cognitive environment. Though scholars are surely still grappling with many of the same hindrances that have historically plagued the field, increasingly robust and refined methodology and cross-discipline collaboration have reinvigorated the field and ushered in a new era of discovery.

References

Bloom, P., & Keil, F. C. (2001). Thinking Through Language. *Mind & Language, 16*(4), 351–367. https://doi.org/10.1111/1468-0017.00175.

Casasanto, D. (2016). Linguistic relativity. In N. Riemer (Ed.), *Routledge handbook of semantics* (pp. 158-174). New York: Routledge.

Frank, M. C., Everett, D. L., Fedorenko, E., & Gibson, E. (2008). Number as a cognitive technology: Evidence from Pirahã language and cognition. *Cognition, 108*(3), 819–824. https://doi.org/10.1016/j.cognition.2008.04.007.

Gilbert, A. L., Regier, T., Kay, P., & Ivry, R. B. (2006). Whorf Hypothesis Is Supported in the Right Visual Field but Not the Left. *Proceedings of the National Academy of Sciences - PNAS, 103*(2), 489–494. https://doi.org/10.1073/pnas.0509868103.

Gordon, P. (2004). Numerical Cognition without Words: Evidence from Amazonia. *Science (American Association for the Advancement of Science), 306*(5695), 496–499. https://doi.org/10.1126/science.1094492.

Kay, P., & Kempton, W. (1984). What Is the Sapir-Whorf Hypothesis? *American Anthropologist, 86*(1), 65–79. https://doi.org/10.1525/aa.1984.86.1.02a00050.

Lucy, J. A. (2016). Recent Advances in the Study of Linguistic Relativity in Historical Context: A Critical Assessment. *Language Learning, 66*(3), 487–515. https://doi.org/10.1111/lang.12195.

Papafragou, A., Hulbert, J., & Trueswell, J. (2008). Does language guide event perception? Evidence from eye movements. *Cognition, 108*(1), 155–184. https://doi.org/10.1016/j.cognition.2008.02.007.

Pishghadam, R., Jajarmi, H., & Shayesteh, S. (2016). Conceptualizing Sensory Relativism in Light of Emotioncy: A Movement beyond Linguistic Relativism. International Journal of Society, Culture & Language, 4(2).

Pyers, J. E., & Senghas, A. (2009). Language Promotes False-Belief Understanding: Evidence From Learners of a New Sign Language. *Psychological Science, 20*(7), 805–812. https://doi.org/10.1111/j.1467-9280.2009.02377.

Thierry, G. (2016). Neurolinguistic Relativity: How Language Flexes Human Perception and Cognition. Language Learning, 66(3), 690–713. https://doi.org/10.1111/lang.12186.

Winawer, J., Witthoft, N., Frank, M. C., Wu, L., Wade, A. R., & Boroditsky, L. (2007). Russian blues reveal effects of language on color discrimination. *Proceedings of the National Academy of Sciences - PNAS, 104*(19), 7780–7785. https://doi.org/10.1073/pnas.0701644104.

Wolff, P., & Holmes, K. J. (2011). Linguistic relativity. Wiley Interdisciplinary Reviews. Cognitive Science, 2(3), 253–265. https://doi.org/10.1002/wcs.104.