

Language and its influence on how we understand reality

Maciej Borowski

The paper is a review of experimental studies which were designed to investigate whether the language we use has influence on the way we perceive and think about reality, as well as to establish if the differences between the languages examined in the reviewed studies result in differences in the behaviour of the speakers. The first set of studies concerns the influence of the use of agentive and non-agentive structures, and presence and absence of grammatical gender. The second focuses on conceptual systems encoded in language and examines the influence of different conceptualizations of space on cognition and memory.

Keywords: *linguistic relativity, agentive/non-agentive structures, grammatical gender conceptualizations of space, cognition, memory*

1. The “hypothesis”

“Not a scientifically testable thesis” (van Troyer 1994: 3), “identified with scholarly irresponsibility, fuzzy thinking, lack of rigor and even immorality” (Lakoff 1987: 304), but also “an idea which has held a perennial fascination for linguists of diverse schools” (Sampson 1980: 81), expressed by a man who comes “once in blue moon” and who was able to grasp “the relationship between events which have hitherto seemed quite separate” and gave “mankind a new dimension of knowledge” (Chase 1959: v). The principle of linguistic relativity, Whorfianism, or the Sapir-Whorf hypothesis, as it is commonly called, is one the most criticized and yet one of the most inspiring ideas in the field of linguistics.

To see how many problems and doubts it creates, one should start with the very name of the aforementioned idea. “Sapir-Whorf hypothesis” is in fact a misnomer, since Edward Sapir, as pointed out by Sampson (1980), was not one of the proponents of the hypothesis, but rather a mentor of Whorf’s, whose general approach the latter adopted. The term was coined by J. B. Carrol, the author of the introduction to the collection of Whorf’s works, printed in 1956.

What is more, the hypothesis is not a hypothesis; not in the scientific sense of this word. As van Troyer (1994) rightly observes, it has never been formulated as one and therefore, for some, it is not possible to test it experimentally.

In addition, it is hard to say that Whorf, with or without the help of Sapir, was the first to claim linguistic relativity, since the idea that the language we use affects our worldview and the way we think had already been proposed by the scholars like Johann Herder and Wilhelm von Humboldt, who lived at the turn of the 19th century.¹

¹ To prove my point, I present two quotations:

“Every nation speaks... according to the way it thinks and thinks according to the way it speaks.” Johann Gottfried Herder (in Wierzbicka 1992: 3)

“[E]ach language . . . contains a characteristic worldview. As individual sound mediates between object and person, so the whole of language mediates between human beings and the internal and external nature that affects them.” Willhelm van Humboldt (in Wierzbicka 1992: 3)

Nonetheless, the idea that the thinking is dependent on language and that the language influences our understanding of the world around us was developed by and is usually associated with Benjamin Lee Whorf.

2. Benjamin Lee Whorf and his work

Benjamin Lee Whorf was born in 1897 and died in 1941 at the age of 44, but despite the shortness of his life, his biography is truly “(...) a matter of more than passing interest”, as J.B. Carroll suggests (Carroll 1959: 1). Whorf became a chemical engineer and combined working as a fire insurance engineer with studying the languages of the Mayas, Aztecs of Mexico and the Hopi from Arizona. His interest in many fields, meticulousness and creativity resulted in his being not only valued in his profession but also recognized as a scholar, even though he had never had an advanced degree.

Interestingly, it was the discoveries he made in the field of fire insurance that made him realize the connection between the language and the behaviour of its speakers.

One of the tasks he was given when he worked in the insurance company was to establish the most frequent causes of fires by analysing hundreds of reports. He expected that the causes would be only of physical nature like, for instance, wrong type of insulation or defective wiring, but it turned out that what also mattered was how people named certain things and situations. For example, around a storage of ‘gasoline drums’, people were careful and paid attention to the safety regulations. However, around a storage of ‘empty gasoline drums’ people were much more careless, they smoked and tossed cigarette butts, as if forgetting that empty gasoline drums are even more dangerous than the full ones, since they contain highly flammable, explosive gas.

Whorf suspected that the reason of the workers’ irresponsible behaviour was the fact that they used the word ‘empty’, which may be understood in two ways. It might be synonymous with the phrases ‘without meaning’ or ‘without content’ or ‘useless’, but we also use it when we examine if a container contains anything. The intended meaning of the word ‘empty’ in the case of the drums was that they did not have their content, their “meaning”-the gasoline, but unconsciously the workers applied the second use pattern of the word ‘empty’ and wrongly came to the conclusion that the drums did not contain anything at all (Whorf in Carroll 1959: 135).

This connection between language and behaviour became an important issue for Whorf and he devoted his studies to find out whether the structures of languages condition concepts such as time, matter or space and whether the patterns of the language influence both behavioural and cultural norms. He contrasted the Standard Average European languages (a group of European languages that, according to him, differed very little) with the Hopi language, a language exotic enough to push us “out of our ruts” (Whorf in Carroll 1959: 138) and to reveal the influence of the language we use that we are not able to observe otherwise. In that sense, “the exotic language is a mirror held up to our own” (Whorf in Carroll 1959: 138).

He claimed that he had found such an influence in, among other examples, the way the Hopi conceptualize time. “A characteristic of Hopi behaviour is the emphasis on the preparation”, he stated (Whorf in Carroll 1959: 148), explaining that counting pattern of the days in Hopi results in different understanding of time; that Hopi do not conceive time as the successive appearance of separate, different days, but rather as the reappearance of the same

day. Therefore, for the Hopi, the change in the future is made only by working on the present situation which impresses on the future not only in the obvious, but also the supernatural way.

Although some critics point out that he was not entirely right (for instance Malotki, to whom both van Troyer (1994) and Lakoff (1987) refer, proves that Whorf did not fully grasped many aspects of the Hopi language) it does not disqualify all his discoveries and the claims he made, among which the most famous and important one is that the reality (Whorf, in van Troyer 1994: 165):

is presented in the kaleidoscopic 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 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

This, according to Chase (Chase, in Carroll, 1959: vi), might be understood in two ways:

First, that all higher levels of thinking are dependent on language.

Second, that the structure of the language one habitually uses influences the manner in which one understands his environment. The picture of the universe shifts from tongue to tongue.

Is it possible that language can have an influence of the kind proposed by Whorf? Does ‘the picture of the universe’ really shift from language to language? To answer those questions, it is necessary to establish the following:

Firstly, do languages differ on the deeper levels, and if they do, in what way?

Secondly, what types of differences are significant enough to say that they might influence our worldview?

Finally, how can we test if they really do?

3. Same world but different labels?

We may define a language (although it will not be an exhaustive definition) as a tool for describing the world around us. We do not always use this tool in order to communicate, to present our description to other people, but we also use it, as Wierzbicka (1992) suggests, for our own purposes. We use it to record and organize our thoughts in the form of diary and calendar entries or notes meant to be read only by their author. Moreover, we swear and exclaim, sometimes without the intention to be heard. Thus, we may say that language is “a tool for expressing meaning” (Wierzbicka 1992: 3).

But whether we communicate or not, we describe objects, events and feelings that we share with other people, since we are the same species, living on the same planet, experiencing similar things. Therefore, we might assume that languages differ, so to say, only on the surface but they are the same when it comes to analysing the meaning, which should be independent of language.

The fact that such an assumption is wrong is obvious for anyone who has ever tried to translate anything from one language to another. The meanings of the words do differ.

Let us examine some examples. Wierzbicka (1992) mentions the distinction between clouds that suggest rain and the ones that do not ('chmury' and 'obloki') in Polish. Also, Polish speakers have two counterparts of the English word 'table' – 'stół' i 'stolik', the first one being a dining table and the latter a coffee or a telephone table. In Japanese, the word 'nezumi' is used in reference to mice and to rats as well, and it does not have any counterpart either in English or in Polish. To this, Hale, Laughren and Nash (in Wierzbicka 1992) add that in Warlpiri, an Australian language, there is a lexical distinction between edible and non-edible plants and animals but no general term for either 'animals' or 'plants'. According to Dixon (in Wierzbicka 1992), another Australian Aboriginal language Nyawaygi distinguishes between 'sun low in the sky in the morning and in the evening' and 'hot sun, when overhead', but does not have a counterpart of the word 'sun'. There is a number of languages that have a word which means both 'hand' and 'arm' (Wierzbicka 1992). In addition, it is impossible not to mention a very famous example of the Eskimo language, which has 22 (or more) words describing snow.

As we can see, even though we share the same experiences (since we all have similarly constructed bodies, mice and rats may be found all over the world, and even snow is a widely experienced phenomenon, if not from the first hand, then from the media), the way they are described in different languages varies.

But what is the weight of the aforementioned examples of differences? Are they significant enough to hold them as the proof for linguistic relativity? It seems not.

Let us take a closer look on the issue of the Eskimos' 22 words for snow. Does the fact that they distinguish between so many kinds of snow make their world more "snowy" than ours? According to Lakoff (1987: 308), this shows very little, and great consequences of so many words for snow are virtually non-existent. The vocabulary is larger, true, but the reason for that is, Lakoff states, that any expert in a given domain will have more words to describe things in this domain and since Eskimos are experts in the domain of snow, it becomes obvious why they have so many words for it. Moreover, Lakoff adds that English-speaking skiers have reported the presence of many more words for snow (like 'powder') and it is also true for Polish language (e.g. 'puch').

From this we learn that differences found only in the language's lexicon are not significant enough to change 'the picture of the universe'. As Lakoff rightly points out, they are isolated and have little effect on anything else. Therefore, to find the influence indicated by Whorf, we must focus on other, more fundamental differences.

4. Which differences are fundamental?

To determine which differences between the languages have such a great significance, and which are simply superficial, we must first establish what features the fundamental differences have.

Firstly, as it was pointed out by Chase (see the quotation above), the part of the linguistic system to affect thought and perception must be in constant, habitual use.

Also, fundamental differences should have one significant consequence that should be taken into consideration when examining study cases: we might expect, since the proof of the pudding is in eating, that those variations will result in differences in the behaviour of the speakers of the languages that differ.

Let us analyse examples of differences that are claimed to support the hypothesis.

4.1 *Influence of agentive and non-agentive structures on agent memory and blame assignment*

Is it possible that the language we use affects our perception of events as well as has impact on how well we remember them? Could language structures guide our judgment? Lera Boroditsky and Caitlin M. Fausey from Stanford University asked themselves this question and conducted a series of interesting studies in order to determine if the use of agentive structures when describing events affects the memory of the speakers, making them pay more attention to the agents and therefore remember them better, and if such differences in memory have impact on how much the speakers blame the agents.

4.2 *Language influence on memory*

Boroditsky and Fausey decided to contrast English with Japanese and, during another study, English and Spanish. In English, agentive pattern of description is appropriate not only for intentional events, but also for accidental ones (Fausey and Boroditsky 2011: 150). An English speaker would say “She broke the vase” even if the agent did it by brushing against the vase unintentionally. In addition to that, non-agentive descriptions often sound elusive to the ears of English speakers. To prove that, Fausey and Boroditsky give an example of Reagan’s rather unfortunate statement “mistakes were made” (2011: 150).

However, according to certain analyses, in other languages, such as Spanish, Japanese and, as far as I can tell, Polish, non-agentive structures are more common and serve as means of telling intentional and accidental actions apart (Dorfman, Filipovic, Maldonado, Martinez, Slobin and Bocaz in Fausey and Boroditsky 2011: 150) In those languages, the more typical description of the abovementioned accident would be “The vase broke itself” (Fausey and Boroditsky 2011: 150).

4.3 *Study 1*

To test whether it is true that English speakers use agentive language more, the Stanford researchers devised an experiment in which English, Spanish and Japanese speakers watched videos of both intentional and unintentional events. In all of them, a man interacted with an object. However, his reactions differed depending on the version of the event. For instance in the intentional version of “knocking the box”, the man faced a table, knocked a box off it and expressed satisfaction. In the unintentional version, he knocked the box off the table while gesturing and after that he reached to grab it. (Fausey and Boroditsky 2011: 152; Fausey et al. 2010: 3). As we can see, it was easy to determine which of the events were accidental.

It is important, for future reference, to mention that in both studies, actors and their shirts were different in half of the videos. Eight events in the experiment with Spanish participants featured a man in a blue shirt, and the other eight- a different actor in a yellow shirt (Fausey and Boroditsky 2011: 152) in the experiment with Japanese speakers, the actors’ shirts were black and white (Fausey et al. 2010: 3).

During the first study, the participants’ task was to describe the video by answering the question “What happened?” that was asked in their native language.

The results confirmed what was expected, namely, that English, Spanish and Japanese speakers used agentive language when describing intentional event equally often (as presented in Table 1).

Table 1 (adapted from Fausey and Boroditsky, 2011: 152; Fausey et al.,2010: 4)

How often did the participants use agentive language when describing an intentional event?				
	English vs. Japanese study		English vs. Spanish study	
	English	Japanese	English	Spanish
Mean	97.12	97.00	95.50	92.46

The studies also established that both Spanish and Japanese speakers were less likely than English speakers to use agentive patterns when describing unintentional events (as presented in Table 2)

Table 2 (adapted from Fausey and Boroditsky, 2011: 152, Fausey et al., 2010: 4)

How often did the participants use agentive language when describing an unintentional event?				
	English vs. Japanese study		English vs. Spanish study	
	English	Japanese	English	Spanish
Mean	69.24	51.69	74.55	59.61

4.4 Study 2

However, the researchers did not only measure the distribution of agentive language in the description of the events. They were interested to know whether that distribution has any effect on the participants' memory, their ability to remember the agent. To test that, Fausey and Boroditsky conducted another experiment, composed of two tasks.

During the first one, the participants were shown pictures of objects in one of the three possible orientations and after a short distractor task, they were asked to indicate what picture they saw before. That task was created as the way to measure the participants' memory performance; the results showed that it differed very slightly.

The second task was designed to check how well the participants remember the agents. They watched the same videos as in the first study and then probe videos, in which a third agent appeared as an agent of the same event the participants saw during the first watching. Afterward, they were asked "Who did it the first time?", and they had to answer by clicking on one of the two pictures that depicted agents who acted in the first set of videos.

The results indicate, according to the researchers, that the agents of the intentional events were remembered equally well by the speakers of all three languages (see Table 3).

Table 3 (adapted from Fausey and Boroditsky, 2011: 154; Fausey et al. 2010: 6)

Agent memory tests results for intentional events				
	English vs. Japanese study		English vs. Spanish study	
	English	Japanese	English	Spanish
Mean	71.55	70.44	78.18	78.00

However, in both studies, the agents of accidental events were remembered slightly better by English speakers (see: Table 4).

Table 4 (adapted from Fausey and Boroditsky 2011: 155; Fausey et al. 2010: 6)

Agent memory tests results for unintentional events				
	English vs. Japanese study		English vs. Spanish study	
	English	Japanese	English	Spanish
Mean	73.06	66.07	78.98	73.75

The researchers admit that it is not true that the use of non-agentive language makes the Spanish or Japanese speakers unable to remember the agents and that the results of the memory task depend on many other factors (Fausey and Boroditsky 2011: 155), yet for them, the findings suggest a correspondence between differences in language patterns and differences in cognition.

4.5 Study 3

To test to what extent the language itself influences people's attention and memory, another study was conducted, in which English speaking participants were first asked to complete an object-orientation task as described above, then were exposed to either agentive or non-agentive sentences and finally, they completed the agent memory task from Study 2. The researchers argue that the long-term influence of language is a result of the fact of being exposed to many short-term events in which certain patterns are used (Fausey et al. 2010: 7), and they wanted to establish how influential those events are by directly manipulating the participants language environment before the memory task. The researchers assumed that the exposure to agentive patterns will result in people's better remembering the agents.

Again, the results seem to suggest the language influence. The participants who listened to agentive sentences before the task remembered the agents better than those who were exposed to non-agentive structures (M= 78.02 for the participants primed with agentive language, M = 70.69 for the other group), even though their results in the object-orientation memory task were similar (agentive M = 71.40, non-agentive M = 75.63) (Fausey et al. 2010: 8).

That confirms, according to Fausey and Boroditsky, the influence of language on memory and that the language environment has a role in guiding people's attention, making them focus more on the agents (Fausey et al. 2010: 8).

5. Influence of language on decisions about blame and punishment

The aforementioned studies rise another interesting question, namely, is it possible that the language we use affects more than just our memory? If the use of agentive language focuses our attention on the individuals involved in the events, would we blame them more for the consequences of those events if agentive language was used to describe the situation?

Fausey and Boroditsky noted that linguistic framing may potentially have dire consequences. According to their article (Fausey and Boroditsky 2010: 644), if the agentive phrase was used in the court records, the court found the defendant guilty more often (76% guilty if the phrase used was "broke it, 70% if the phrase was "it broke"; 77% for "burned it" and 57% for "it burned", 65% when the verb used was "killed" and 56% when the verb was "died").

Of course, and the researchers admit that, it is not possible to conclude from those statistics that it was the use of certain linguistic structures that caused the differences in the verdicts. Nonetheless, the problem interested the authors and they decided to establish if language has an impact on the perception of blame and decisions concerning punishment.

5.1 Study 1

In Study 1, participants read either agentive or non-agentive description of a fire that caused some damage in a restaurant. Later, they were asked to evaluate how much the person who was involved in the accident should be blamed for it, as well as to establish how much this person should pay for the damage caused by the fire. They evaluated blame using Likert scale that ranged from 1 to 7, where 1 meant *Not at all to blame* and 7 stood for *Completely to blame*. As for the costs, the participants were supposed to express the number in dollars.

Results once again seem to suggest influence of language: those among the participants who read the agentive description blamed the person involved more ($M = 4.83$) than those who read non-agentive one ($M = 4.01$). That difference resulted in that the participants who read the agentive report decided that the financial punishment should be higher (they decided that the person involved should pay $M = \$935.17$, the group that read the non-agentive description fined that person $M = \$688.75$) (Fausey and Boroditsky, 2010: 645).

5.2 Study 2

However, the aforementioned influence of the language on the financial punishment might be conceived as indirect, since the punishment depended on how much people blamed the person involved. Fausey and Boroditsky wanted to know whether language could directly influence decisions about the punishment, that is why they designed another study (Fausey and Boroditsky 2010: 646), in which another group of participants read not only the agentive or non-agentive description of the restaurant fire, but they also learned how an independent panel judged the person involved in the accident (the panel attributed low, middle or high blame). The assumption was that if the participants knew how blameworthy other people claim the agent to be, the influence of language alone would be more pronounced.

The results showed that people blamed the person involved more if the independent panel did the same. In addition to that, the general tendency was that the people who read the agentive description, ruled higher penalty than the people who were shown the same opinion of the panel, but read non-agentive description. That difference was the most evident in the group that learned that the panel attributed middle blame to the agent.

5.3 Study 3

In all of the studies presented before, the participants received only linguistic information. The last study, however, was designed to establish whether the framing has any influence when the people not only imagine the situation basing on the description, but are able to eye-witness the event (Fausey and Boroditsky 2010: 647).

The materials used in that study were: a 6-second video and an agentive and non-agentive descriptions of a “wardrobe malfunction incident”, a widely covered accident of

2004 Super Bowl performance of Justin Timberlake and Janet Jackson, at the end of which Jackson's breast was exposed.

The participants were divided into six groups; the first group only read the agentive description, the second read the description and then watched the video, and the third watched the video before reading the account. The conditions for the other three groups were the same, except for the fact that they read a non-agentive description of the incident. Later, the participants had to allocate the percentage of blame to Timberlake, Jackson and chance, as well as to decide how much Timberlake, Jackson and CBS (a TV network that broadcast the event) should be fined.

The overall results show that in all three conditions people who read agentive description were more likely to hold Justin Timberlake responsible for the incident ($M = 38.7\%$ for people who read agentive account; $M = 30.49\%$ for those who read non-agentive one) (Fausey and Boroditsky 2010: 647). In addition to this, 46.7% of people who read the agentive description decided to fine Timberlake, compared to 38.5% of participants that read the non-agentive one. Furthermore, the fines given were higher if the account read was agentive ($M = \$88,818.12$ for agentive account readers, $M = \$57,989.43$ for non-agentive) (Fausey and Boroditsky 2010: 648)

6. Discussion

“The first thing to say about those results is that the differences are not very big”, wrote Mark Liberman (2010) in his Language Log entry in which he discussed Boroditsky's studies concerning differences between English and Spanish and Japanese. It is hard not to notice that the performances of the speakers were only just statistically significant.

The authors of the aforementioned studies argue, however, that those differences matter, especially when they are observed in situations on which the course of somebody's life might depend; they could, for instance, result in a prison sentence.

Are they, however, a good enough reason to claim, as it was done in the subhead of Boroditsky's article on the subject that appeared in the Wall Street Journal, that “language profoundly influences the way people see the world” (Boroditsky, 2010) or that there is “a different sense of blame in Japanese and Spanish”?

According to Liberman (2010), we can conclude that

Even modest statistical differences in the way that different language communities tend to express things may correlate with modest differences in the way that their members remember things, if the experimental circumstances are carefully calibrated to produce memory performance in a range that allows these effects to be measured.

Furthermore, those ‘modest’ differences also correlate with similarly modest differences in assigning blame and punishment. Does it prove that the language influences thought? It rather suggests, as it was put by Lane Greene (Greene in Liberman 2010), that “language nudges thought (in certain circumstances)”.

6.1 Influence of grammatical gender on perception and gender identity development

Grammatical gender seems to be a promising subject for all of the researchers who support Whorf's hypothesis and, in fact, there is a number of studies conducted to determine whether grammatical gender (or the lack of it) has any influence on perception and conceptualization. Some other researchers argue that the process of developing gender identity of young speakers is affected by the gender loading of their language.

6.2 Grammatical gender and attributes assignment

The first of the studies, conducted by Katz from Haifa University was designed to test whether grammatical gender causes any difference in how speakers perceive objects.

There were two groups of participants, one comprising of undergraduate students that spoke Hebrew and another of secondary school students who spoke Arabic. The choice of the languages gave the researcher a chance not only to compare the differences between the languages but also 'within' them, since both Hebrew and Arabic have synonyms that belong to different gender categories. For instance, in Hebrew, the synonyms for 'moon' are 'Le-Va-Na', which is female and 'Ya-Re-Ach', which is male. In Arabic, the pair of synonyms for 'socks' is female 'kel-sat', and male 'gwa-reb' (Katz 2013: 19).

In the study, the participants were given a questionnaire, which contained two pages of words and their task was to evaluate, on 1-7 Likert scale, their strength (Weak[1] – Strong [7]), heaviness (Light [1] – Heavy [7]) and gender (Feminine [1]- Masculine [7]). The first page contained both masculine and feminine words and the other their synonyms of a different grammatical gender.

Katz's hypothesis was that male words would be evaluated as more 'masculine' than their female counterparts and he assumed that those 'masculine' attributes are heaviness and strength.

The results suggest that there is a correlation between these attributes and the grammatical gender of the test items. Hebrew speakers rated the masculine words as stronger (Mean= 5.61) and heavier (M= 4.02) than the synonyms of the opposite gender (M= 5.37 for strength and M= 3.78 for heaviness) (Katz 2013: 21).

The Arabic speakers also rated male items as heavier (M= 4.28, compared to M= 4.09 for female items). However, contrary to the hypothesis, masculine words were described as lighter than their female synonyms (M= 4.69 for male, M= 4.79 for female) (Katz 2013: 20).

Nonetheless, Katz points out that results contradicted the hypothesis only in the case of one attribute and claims that the hypothesis was confirmed; thus, he argues, we can say that generally speaking, grammatical gender influences the assignment of those attributes (Katz 2013: 21).

6.3 Influence of grammatical gender on perception

Katz's study shows that the perceived gender, gauged by the attributes assigned, may sometimes differ from the grammatical gender. That raises interesting questions, namely, what is more important: the perceived gender or the grammatical one?

What gender would speakers assign to the object if its perceived attributes belonged to a different gender category than the word describing that object?

Mary Flaherty from University College Dublin designed a test to answer those questions. She conducted a cross-cultural study in which English-, Japanese-, Spanish- and French- speaking participants took part. They were presented two booklets with cartoons depicting 20 objects. Their first task was to choose a typical name (female or male) for the object and to decide whether it is male or female by circling a picture of a boy or a girl next to the cartoon. In the second task, in which they used the other booklet, they had to choose one from the pair of the following set of pairs of attributes: low-high, warm-cold, little-big, beautiful-ugly, sad-happy. According to Flaherty, the first items in the pairs were female and the latter male (Flaherty 1999: 3).

The hypothesis the study was meant to test was that speakers of the languages that have a grammatical gender system, such as Spanish and French, would conceptualize objects according to the grammatical gender, which means that they would assign the gender in accordance with the grammatical category of the word, even when they assign more attributes associated with the opposite gender to it. In contrast, speakers of the languages that have a limited gender system, such as English and Japanese, will assign the gender basing on the perceived gender of the objects.

The researcher compared the predominant assigned gender (over 60% of all the answers had to indicate one of the genders for it to be described as ‘predominant’) with predominant attributes that were assigned (the answer was qualified as ‘masculine’ if the participant chose 3 or more of the 5 attributes associated with maleness and ‘feminine’ if 3 or more attributes were associated with femaleness; the same rule for determining ‘predominance’ was applied). The results of the abovementioned comparison are presented in Table 5.

Table 5 (adapted from Flaherty, 1999: 5-7)

language	cases in which gender was assigned in accordance with the grammatical gender of the noun (out of 20 objects)	cases in which gender was assigned in accordance with the attributes (out of 20 objects)	cases in which the assigned and perceived gender were the same as the grammatical gender of the noun (out of 20 objects)
Spanish	17	1	9
French	17	1	10
English	no grammatical gender	11	no grammatical gender
Japanese	no grammatical gender	15	no grammatical gender

That means, according to Flaherty, that the gender chosen by French and Spanish speaking participants was related to the grammatical gender of the noun. However, she rightly notices that “other factors must have been relevant” (Flaherty 1999: 5) since there was no case in which all the participants agreed on the gender of the word. Such an agreement, or at least results close to 100%, would be expected in all of the cases if the choice of gender was dependent only on the grammatical gender of the noun (Flaherty 1999: 5).

As far as English and Japanese are concerned, Flaherty claims that the choice of gender was guided by the assigned attributes (Flaherty 1999:7).

Flaherty concludes that the grammatical gender has influence on how speakers of the languages with a grammatical gender system conceptualize objects (Flaherty 1999: 7).

However, it is difficult to agree with the following statement that summarized the data collected from the Spanish and French speaking participants: “In almost all cases, the gender attributed to the object matched the grammatical gender, overriding their perceived attributes” (Flaherty 1999: 7-8).

It is true that the gender assigned by the participants was the same as the grammatical gender of the noun in the majority of cases (17 out of 20 for both French and Spanish), yet in many cases the perceived gender and the gender of the assigned attributes were the same as grammatical gender of the word. That means that the perceived attributes were ‘overridden’ only in 8 out of 17 cases for Spanish and in 7 out of 17 cases for French speakers.

Nevertheless, the aforementioned studies suggest that the grammatical gender system to some extent influences perception and cognition, and it would definitely be interesting to determine how great that influence is and whether it is still observable anywhere else in human cognition.

6.4 Grammatical gender and gender identity development

To test if the grammatical gender system of a language may have any influence on how quickly a child develops its sexual identity, and to examine whether the differences between those systems in different languages result in variations of the pace of the identity attainment of the speakers, an international team of researchers, including Alexander Guiora, Benjamin Beit-Hallahmi, Risto Fried and Celia Yoder, conducted a study in which groups of Israeli, American and Finnish children were tested.

The languages were chosen because they differ in an aspect for which the researchers coined the name ‘gender loading’, which rates the extent to which it is necessary for a speaker to note their own sex as well as the sex of the others (Guiora et al. 1982: 3). In English, as it was mentioned before, gender has very little importance, yet the speakers are forced to think about it in some cases, for example when choosing a third person singular pronoun. Therefore, ‘gender loading’ in English was rated as ‘very low’ (Guiora et al. 1982: 3). Finnish was said to have “almost zero gender loading” (Guiora et al. 1982: 3). The language does contain some words “in which gender of the referent is the part of [their] meaning” (Guiora et al. 1982: 2) such as boy and girl, and the feminine suffix ‘tar’ was used in few cases, such as ‘kuningatar’ – ‘queen’ or ‘laulajatar’ – ‘female singer’² (Guiora et al. 1982: 2) but apart from that, gender has no grammatical significance. On the other hand, in Hebrew, all nouns have gender and the gender-based distinction of the pronoun is obligatory not only in the third but also in the second person, both in singular and in plural. As far as marking gender in the verb forms is concerned, a speaker of Hebrew (as opposed to Finnish and English) must mark a distinction for the third and second person singular and plural, and in the present tense, in the first person, too (Guiora et al. 1982: 2-3). Thus, the researchers claim Hebrew to have “very high” ‘gender loading’ (Guiora et al. 1982: 3).

The researchers hypothesized that the children whose native language is a language with high ‘gender loading’ will attain gender identity sooner than children who are brought up in a linguistic environment in which ‘gender loading’ is low. That hypothesis was based on an assumption that differences in marking gender will result in differences in perceiving gender.

² According to the researchers, „use of the ‘tar’ suffix is archaic [and it] has practically no significance in current usage” (Guiora et al., 1982: 2).

To test the children’s own gender recognition, the Michigan Gender Identity Test (MIGIT) was used. To successfully complete the test, a child had to sort pictures of nonhuman objects (such as balls and dogs) and children of both sexes into groups basing on the sex, and to add its own picture (taken on the spot) to one of the groups. In addition to that, a child had to correctly answer the Gesell question (“Are you a little boy or a little girl?”) (Guiora et al., 1982: 5)

The participants were from three different language environments: English in the United States of America, Hebrew in Israel and Finnish in Finland and their age varied from 16 to 42 months.

The results for age and language groups are presented below (Table 6) as they were presented in the article

Table 6 (Guiora et al.1982: 6)

Proportion of successful gender identification/ total number of subjects, for age groups in months and 3 language groups							
	Age						
	16-21	22-24	25-27	28-30	31-33	34-36	37-42
Hebrew	0/4	1/6	9/16	8/16	12/20	9/14	10/13
English	0/13	0/13	5/21	3/14	9/21	11/15	4/4
Finnish	1/8	0/7	2/12	0/6	3/11	4/7	13/21

The authors claim the hypothesis to be supported (Guiora et al. 1982: 9) but as they rightly point out, “there are several ways to examine the data to determine descriptively the rate of gender identity attainment” (Guiora et al. 1982: 9). The researchers argue that the fact that the “Hebrew sample reaches [in the group between 25-27 months] and exceeds 50% of success considerably ahead of either the English or the Finnish sample” is a proof good enough to make the aforementioned claim. However, it is worth noting that the predicted order of the samples with most successful answers is visible only in the results of 3 age groups: 25-27, 28-30 and 31-33. The results of the next two groups show that American children were better at identifying their own gender, even reaching 100% of correct answers in the age group 37-42, unlike the Israeli participants. It might be argued that, if the ‘gender loading’ influenced the rate of gender attainment in the sense that it made the speakers of the language with high ‘loading’ identify their own gender earlier in life, not only would they be first to produce correct answers, but also to reach 100% of correct answers.

Although statistical calculations show that there is a relation between proportion of successes and the country, it is difficult not to agree with the authors when they say that (Guiora et al. 1982: 12):

“[w]hile the findings of this research may suggest a confirmation of the so-called Whorfian hypothesis, one must bear in mind that the interaction between language, culture and personality development is much more complex and much more differentiated than a structural relativistic theory would predict”

7. Summary

Irrespective of how intriguing the studies and creative the researches were, it seems impossible to hold the results presented above as evidence of language influence on perception and cognition. A little bit of correlation in certain circumstances is not a convincing proof and real-life consequences of those correlations are hard to imagine.

7.1 Conceptualisation and the principle of linguistic relativity

The analyses of the studies show that the differences in grammar do not result in differences in perceiving reality. But Whorf's theory is not to be dismissed completely, since there is one more way to approach the issue of language influence.

As Wierzbicka (1992: 7) points out, a language “doesn't reflect the world directly: it reflects human conceptualization, human interpretation of the world”. Therefore, we might argue, whenever the languages differ in the way they describe a concept, speakers' perception and understanding of that concept should differ too.

It seems reasonable to assume that the most essential differences would concern fundamental concepts. This raises an obvious question, namely: what concepts are fundamental?

It is often the case that the fundamental concepts are the basis on which other concepts are created and if the first differ, the latter will differ, too. Therefore, a fundamental concept is a concept that affects the conceptual system.

Furthermore, a concept that is fundamental is not used deliberately, but rather automatically or ‘habitually’, to put it in Whorf's words, which is in accordance with what has been said about the fundamentality of differences.

That is why the concept of time in Hopi was of primary interest for Whorf, and why researchers such as Brugman and Casad, whose studies of Mixtec and Cora languages Lakoff presents (Lakoff 1987), have focused on the concept of space in those languages. Indeed, space and time seem to be good examples of fundamental concepts.

Let us consider the example of spatial locations conceptualization in Mixtec, basing on Brugman's study as it was described by Lakoff (1987: 313-315).

I would like to present some English sentences with their Mixtec equivalents, as well as their word-by-word translations and approximated meaning.

Table 7 (adapted from Lakoff 1987: 313-315)

English sentence	word-by-word translation	meaning
The stone is under the table	yuù wǎ híyaà çì-mesá stone the be+located belly-table	Stone is located the table's belly.
He is on the top of the mountain.	híyaà-ðe šini-yúku be+located-3sg.m. head-hill	Hi is located the mountain's head.
I'm sitting on the branch of the tree	ndukoo-rí nda? a-yúnu sit-1sg. arm-tree	I am sitting the tree's arm
I am standing in front of Maria	hindi-ri nũũ-maría stand-1sg. face-Maria	I am standing Maria's face

As we can see, Mixtec speakers project body-part terms onto objects in order to understand spatial relations, and such a conceptualization of space is grammaticalized. Moreover, as the next examples will illustrate, the way they understand spatial relations affects the way they understand certain social relations. As Lakoff points out (1987: 315), *nũũ* ('face') evokes face-to-face interaction and that is why it is used when talking about face-to-face actions:

Table 8 (adapted from Lakoff 1987: 315)

English sentence	word-by-word translation	meaning
I gave a horse to your son	ni-haʔa-rí ʔn kiti nũũ-seʔe-ro perfv.-pass-1sg. one horse face-son-2sg.	I gave a horse your son's face.
I taught my son to work	ni-s-naʔa-rí nũũ-séʔé-rí ha sátiũ perfv.-cause-know-1sg. face- son-1sg compl. work	I taught work my son's face.

Does it mean that Mixtec, at least in this aspect, fundamentally differs from English or Polish? How can we say it does, when it is possible to translate those sentences? To quote Lakoff, "the criterion of getting the *truth conditions* right in sentence-by-sentence translation ignores what is in the mind" (Lakoff 1987: 316). And what seems to be in the minds of Mixtec speakers is a different way of interpreting the world.

However, it is hard to imagine what possible impact on the speakers' behaviour the aforementioned way might have, therefore I doubt whether the example of Mixtec may be considered a proof of linguistic relativity.

There is a language, however, in which the way space is conceptualized has greater consequences. The series of studies of the Tzeltal language show an influence of the language on cognition.

7.2 Frames of reference

According to Levinson (1996), spatial descriptions may differ in the frames of reference that are employed and the distinctions he makes are of considerable importance when it comes to analyzing the results of the experiments, that is why I shall present them below.

When a speaker uses the intrinsic frame of reference, he describes a spatial location of an object in relation to another object features, as in a sentence "the boy is at the front of the chair". In the relative frame of reference, the coordinates are based on the perspective of the viewer. We may say "the boy is to the left of the chair", but we would change that description to 'the boy is to the right of the chair' if we stood on the other side of the chair. In the absolute frame of reference, coordinates are based on fixed or cardinal directions, as in "the boy is north of the chair" (Levinson et al. 2002: 158).

Languages differ not only in the amount and combinations of the frames they employ but also in their prevalence. In English, for example, all three are available, but the absolute is rarely used.

7.3 Frames of reference in Tzeltal

As we read in Levinson (1996), in a Tenejapan dialect of Tzeltal, a Mayan language spoken in Chiapas, Mexico, the intrinsic frame of reference is used but only to “describe objects in a strict contiguity” (Levinson 1996: 111). In addition to this, certain expressions, such as “to the left/right”, “behind” or “in front” are not available.

Therefore, to describe location of objects separated in space, the speakers of Tzeltal make use of an absolute system that is derived from features of the environmental surrounding. Since they live in the mountainous area, that “nevertheless exhibits an overall tendency to fall in altitude towards the north-north-west”(Levinson 1996: 111), Tenejapans use words “downhill” and “uphill” to designate approximately north (the former) and south (the latter). Furthermore, the language does not have words for “east” and “west”, and only one word to describe horizontal axis is used, as well as references to landmarks to specify the description. As a consequence, a Tzeltal speaker might say “the boy is uphill the tree” but not “the boy is behind the tree”.

The aforementioned absolute system is used widely when describing locations, and echoes in the language,³ which proves its importance. Its presence in the language also results in Tenejapans good spatial orientation. As it was proven in the tests, they point in the same “downhill” direction, even when outside their territory (Levinson 1996: 111).

As a part of a larger project, Levinson conducted a series of experiments to determine whether there is a correlation between linguistic and nonlinguistic coding.

7.4 Use of the frames of reference in nonverbal tasks

The underlying design of all of the experiments below was similar and I present it as it was done by Levinson (1996: 113-114). Participants saw an array on the table (the simplest example would be an arrow pointing to their right and to north, objectively), which was then removed and, after a delay, the participants were led to another table, rotated by 180°, and asked to choose an arrow like the one they saw on the first table. By choosing the arrow facing right, a participant proved that he used a relative frame of reference when coding the array, since the coordinates rotated as well. However, choosing the one pointing to the same cardinal direction, irrespective of the participant’s position, meant that the array was coded in the absolute frame of reference.

The experiments involved around 25 Tzeltal-speaking and 39 Dutch-speaking participants (the numbers differed slightly in experiments) of mixed age and sex.

The hypothesis was that the Dutch participants would solve the task using relative frame of reference (since it is dominant in the language, just as it is in English) and that the Tenejapans would use absolute frame of reference (because it is a dominant one in Tzeltal).

³ “The three-way semantic distinction between ‘up’, ‘down’ and ‘across’ recurs in a number of distinct lexical systems in the language. Thus there are relevant abstract nominals describing the directions, specialized concrete nominals of different roots for describing e.g. edges along the relevant directions, and motion verbs designating ascending (i.e. going south), descending (going north) and traversing (going east or west). This linguistic ramification, together with its insistent use in spatial description, make the three-way distinction an important feature of language use” (Levinson, 1996: 111). This also confirms the claim that the concept of space is fundamental because it affects the conceptual system.

The researchers made sure not to use either of the frames of reference in the instructions; an example of one is “point to the pattern you saw before” (Levinson, 1996: 114).

7.4.1 *Experiment 1*

The participants were presented a set of four animals, all heading the same direction. Then, the participants were asked to memorize the array and after a delay they were rotated by 180° and had to recreate the array as it was, on a second table. There were five main trials. The answer was marked as ‘absolute’ when the animals were heading the same cardinal direction as on table 1, or as ‘relative’ when egocentric left/right directions were preserved.

The results (Levinson 1996: 115) show that indeed there is a relation between linguistic and nonlinguistic coding. 95% of Dutch participants consistently (meaning in at least 4 out of 5 trials) coded the array using the relative frame of reference and 75% Tzeltal participants used the absolute frame.

Levinson (1996: 115) explains the inconsistency in Tenejepans’ performance, saying that it might have been due to “*school-like nature of task*” (Levinson 1996: 115), the fact that Tenejepans were unfamiliar with the testing situation or the availability of egocentric frame in the language.

It is worth mentioning, however, that only two Tzeltal speakers were consistently coding using the relative frame of reference. As pointed out below, the results were repeated in other experiments as well.

7.4.2 *Experiment 2*

In the second experiment (Levinson 1996: 115-116), five cards were used. On the cards there was a small green circle and a large yellow circle. One of the cards was a stimulus, presented on table 1 in a certain orientation. The rest of the cards were arranged on table 2. The participants, after memorizing how the circles were orientated on the stimulus card, a short delay and 180° rotation, were asked to point to the card most similar to the one they saw on table 1.

Once again, a relative response meant that egocentric orientation was preserved (e.g. big circle towards me) and absolute when circles on the selected card were orientated in accordance with the fixed bearings (e.g. big circle north).

Again, results show that Dutch speakers coded using relative frame, and Tzeltal speakers - using the absolute one. 80% of the Tenejepans whose performance was consistent in at least 6 out of 8 trials coded in absolute frame of reference.

As it has been pointed out (Levinson 1996: 117), the same factors as in Experiment 1 might have been the reason for the inconsistency of Tenejepans, but additionally, in this experiment, the participants were presented with an array that was arranged also on the east-west axis, for which they have only one label.

7.4.3 *Experiment 3*

In the following experiment (Levinson 1996: 118-121), the participants had to draw a nonlinguistic conclusion concerning the arrangement of the objects. On table 1, they were shown two objects (A and B) of distinct shape and colour and in a particular array, as in the example below (all figures after Levinson 2002: 119-121) :

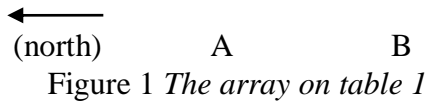


Figure 1 *The array on table 1*

Later on, the participants were rotated and led over to a second table, on which they saw a new array: one of the objects they saw on table 1 and a new one (C).

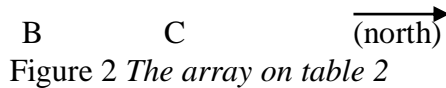


Figure 2 *The array on table 2*

Then, they were rotated back to table 1, from which the object B was removed, and asked to place the object C in a location consistent with the arrangements they saw. If the object C was placed to the right of the object A, it meant that the participant coded in the relative frame.

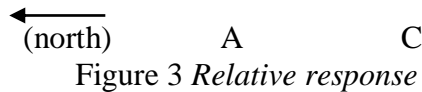


Figure 3 *Relative response*

When the object C was placed to the left of the object A (and to the north of the missing object B), the response was absolute.

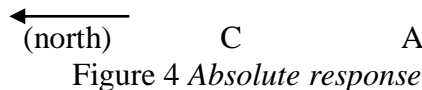


Figure 4 *Absolute response*

There were 10 trials and the participants were asked to remember the arrangement of the object located either on the north-south or the east-west axis.

The results were similar to those from the previous studies. Dutch speakers were consequently coding using the relative frame, whereas Tzeltal speakers -using the absolute frame. 90% of the Tenejapan participants whose performance was consistent in at least 7 out of 10 trials gave the absolute response.

7.4.4 *Experimental response*

The results from all three studies suggest that there is a relation between the way space is conceptualized in the languages and the performance in nonlinguistic tasks. However, another team of researchers, Li and Gleitman, claimed that the fact that Dutch participants produced relative responses was mainly because of differences in the environment where the experiments were conducted and they went on to test whether the results would differ if the conditions differed as well.

Li and Gleitman (2002: 276) argued that “the results found for the Dutch and Tenejapan subjects might be attributable to the differential availability of [...] landmark information in a laboratory room versus in some other spatial setting” since the Dutch speakers were tested in a laboratory room, and Tzeltal speakers outdoors, in the environment they were familiar with, in front of a large house. Li and Gleitman designed a series of experiments essentially similar to the tasks from Levinson’s first experiment, but they manipulated the context by adding landmarks or cues both outside and on the experimental tables.

They tested 40 English-speaking subjects, rightly assuming that the dominant frames of reference in English is the same as in Dutch. Ten of the participants were tested in a room

“which was essentially featureless except for a floor-to-ceiling window forming one side of the room” (Li and Gleitman 2002: 276) with the blind pulled down. Another group was tested in the same room, this time with the blinds pulled up. The last group, consisting of 20 participants, was tested outside in an area around which buildings were ranged.

The participants’ task was to memorize an arrangement of three toy animals on table 1, all heading the same cardinal direction, and to recreate the same arrangement on a second table after a 180° rotation.

According to Li and Gleitman (2002: 227), the results show that in the Blinds-Down condition, most of the participants coded using relative frame of reference. However, in the other conditions, they were divided in their preference, and the numbers of consistent relative and absolute responses were almost the same.

In the second experiment, 40 new subjects participated and another toy (a pair of kissing ducks) was used as a landmark added on the tabletop on both stimulus and recall tables. The participants were divided into two groups, tested in slightly different conditions. In condition 1, the ducks were always to the right of the participants, and in condition 2, the ducks were always on the south side of the table (Li and Gleitman 2002: 280-281).

Results show that in the first conditions, the answers were predominantly relative, but in the second one, they were mainly absolute.

Taking the results into the account, the researchers claim that the strategy of solving the tasks depends on whether the landmarks are present and not on the dominant linguistic frame of reference (Li and Gleitman 2002: 285).

7.4.5 What did the experiments show

As a response to Li and Gleitman’s doubts and experiments, Levinson and his team published an article in which they carefully explained the theoretical background of their research as well as presented the results of yet another set of experiments that supports the idea of language influence.

First of all, Levinson et al. (2002: 159) referred to other studies of languages that use absolute frame of reference and pointed out that absolute responses were produced in the indoor conditions as well (Pederson et al. and Levinson, in Levinson 2002: 162).

In addition, it is made clear that the conditions under which Tzeltal speakers were tested resembled Li and Gleitman’s indoor with windows condition, since the participants were tested “under a low veranda, with restricted visual access” (Levinson 2002: 162).

Secondly, Levinson (2002: 163) claims that Li and Gleitman’s experiment was simplified to the extent that the participants realized that they were to memorize direction and that they were guessing the experimenter’s intentions. The original experiment was presented as a task in which the subjects had to remember order and identity of the objects.

As far as the ‘ducks experiments’ are concerned, Levinson suggests (2002: 173) that the participants understood the whole arrangement (involving the ducks) as one array, therefore they coded it using intrinsic (object in relation to another object features) not absolute frame of reference. The distinction is important, because the intrinsic frame of reference is, along with the relative one, commonly used in the languages tested.

Finally, to prove that neither Dutch nor English speakers use absolute frame of reference, Levinson et al. reported the experiments they had conducted, among which one is particularly convincing.

In that experiment, ten Dutch participants were shown a set of three animals arranged on a table on which a ‘landmark’ (a toy duck pond) was also placed. They were asked to

memorize and recreate the array, but this time, they were rotated only 90°. If the array was recreated so that the animals were facing towards or away from the duck pond, the answer was intrinsic, if the fixed bearings were preserved, the answer was absolute. Interestingly, the relative response was not possible. The depiction of the layout presented below is taken from the discussed article.

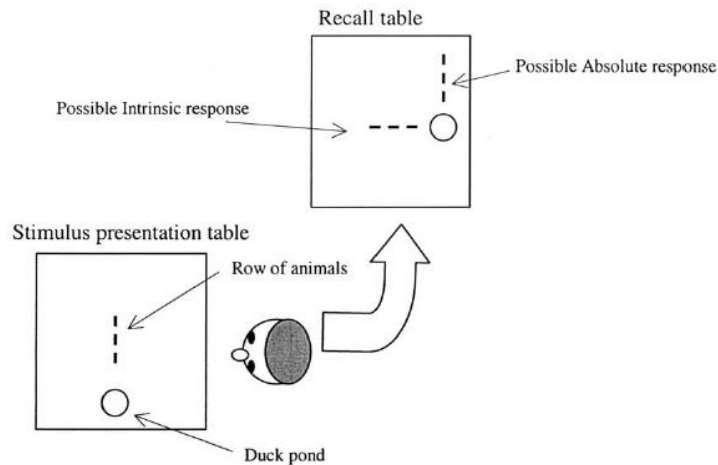


Figure 5 Possible responses in 90° rotation experiment (Levinson et al. 2002: 178)

The results of the abovementioned experiment show that the majority of the participants gave intrinsic responses; the mean number of those responses was 3.7 out of five trials (Levinson 2002: 178-179).

8. Conclusions

The discussion and experiments presented in this chapter imply that conceptual systems that are encoded in the language affect nonlinguistic behaviour. Additionally, the speakers of languages that vary in the way they conceptualize fundamental concepts such as space indeed differ in the way they perceive reality, since being a speaker of Tzeltal means adopting a way of looking at space that is not a usual English, Dutch or Polish way.

All that has been presented in this paper so far leaves us with the following question: is Whorf's claim true or is just a fancy idea that cannot be proven?

A closer examination of the studies that are claimed to support the idea of linguistic relativity reveals, rather disappointingly, that grammatical structures or categories alone affect our thinking and behaviour so slightly that despite what the researchers maintain, it is difficult to say that there is any kind of influence at all. We can conclude that the speakers are perfectly capable of understanding the concepts that are not saliently present in their languages and that their behaviour does not seem to be influenced by the syntax of utterances. What is only just statistically significant has little importance when a common sense approach is adopted.

However, when a usual way of understanding and organising the concept is reflected in a usual way of speaking about it or, to put it in different words, when using a structure means adopting a certain perspective of looking at the things we talk about, the differences

are not only more pronounced but they also seem to have an impact on our thinking and behaviour. We adopt that perspective unconsciously, only because *the structure* seems 'correct' or 'common' or to be 'what we should say' in that situation. It does not mean that we are unable to think in any other way, but it certainly means that there is much more to mastering new languages and studying them than it seems at first glance. Personally, I find this to be an exciting conclusion.

References

- Beit-Hallahmi, Benjamin & Catford, J. C. & Cooley, Ralph E. & Yoder, Celia. & Guiora, Alexander Z. & Raluszny, Maria. 1974. Grammatical Gender and Gender Identity Development: Cross Cultural and Cross Lingual Implications. *American Journal of Orthopsychiatry* [online] 44(3). 424-431. Available at: <<http://hdl.handle.net/2027.42/72723>>
- Boroditsky, Lera. 2010. Lost in Translation. In *Wall Street Journal* [online]. Available at: <<http://online.wsj.com/news/articles/SB10001424052748703467304575383131592767868>>
- Carroll, John B. (ed.). 1959. *Language, thought and reality: Selected writings of Benjamin Lee Whorf*. New York, London: The Technology Press of Massachusetts Institute of Technology and John Wiley & Sons, Inc.
- Chase, Stuart. 1959. Foreword. In Carroll, John B. *Language, thought and reality. Selected writings of Benjamin Lee Whorf*. New York, London: The Technology Press of Massachusetts Institute of Technology and John Wiley & Sons, Inc.
- Fausey, Caitlin M. & Boroditsky, Lera. 2010. Subtle linguistic cues influence perceived blame and financial liability. *Psychonomic Bulletin & Review* 17(5). 644-650.
- Fausey, Caitlin M. & Boroditsky, Lera. 2011. Who dunnit? Cross-linguistic differences in eyewitness memory. *Psychonomic Bulletin & Review* 18(1). 150-157.
- Fausey, Caitlin M. & Long, Bria L. & Inamori, Aya. & Boroditsky, Lera. 2010 . Constructing agency: the role of language. Available at: <<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3153776/pdf/fpsyg-01-00162.pdf>>
- Flaherty, Mary. 1999. The Influence of Language Gender System on Perception. Available at: <<http://ir.library.tohoku.ac.jp/re/bitstream/10097/54786/1/0040-8743-1999-58-1.pdf>>
- Guiora, Alexander Z. & Beit-Hallahmi, Benjamin & Fried, Risto & Yoder, Cecelia. 1982. Language Environment and Gender Identity Attainment. *Language Learning* [online] 32(2). Available at: <<http://hdl.handle.net/2027.42/98322>>
- Katz, Michael. 2013. Grammatical gender and attributes evaluation. *International Journal of Linguistics and Literature* 2. 17-24.
- Kramsch, Claire. 1998. *Language and Culture*. Oxford: Oxford University Press.
- Lakoff, George. 1987. *Women, fire and dangerous things*. Chicago: University of Chicago Press.

- Levinson, Stephen C. 1996. Frames of reference and Molyneux's question: Cross-linguistic evidence. In: Bloom, Paul, Peterson, Mary, Nadel, Lynn, Garrett, Merrill F. (eds.), *Language and space*. Cambridge, MA: MIT Press. 109-169.
- Levinson, Stephen C. & Kita, Sotaro & Haun, Daniel B. M. & Rasch, Bjorn H. 2002. Returning the tables. Language affects spatial reasoning. *Cognition* 84(2). 155-188.
- Li, Peggy & Gleitman, Lila. 2002. Turning the tables: Language and spatial reasoning. *Cognition* 83(3). 265-294.
- Lieberman, Mark. 2010. Never mind the conclusions, what's the evidence? [online]. Available at: < <http://languagelog.ldc.upenn.edu/nll/?p=2592>>
- Sampson, Geoffrey. 1980. *Schools of Linguistics*. Stanford: Hutchinson & Co. Ltd.
- Van Troyer, Gene. 1994. Linguistic Determinism and Mutability: The Sapir-Whorf "Hypothesis" and Intercultural Communication. *JALT Journal*, 16(2). 163-178.
- Wierzbicka, Anna. 1992. *Semantics, Culture and Cognition, Universal Human Concepts in Culture-Specific Configurations*. New York: Oxford University Press.

Maciej Borowski
ul. Łużycka 47/4
30-658 Kraków
adresborowskiego@gmail.com

In SKASE Journal of Theoretical Linguistics [online]. 2015, vol. 12, no.2 [cit. 2014-06-25]. Available on web page http://www.skase.sk/Volumes/JTL28/pdf_doc/06.pdf ISSN 1336- 782X.