Sapir–Whorf Hypothesis: Literary Review

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Abstract

In this paper four topics are being reviewed to see if language changes the perception of: time, objects, personalities/emotional connection, and numbers. Not all studies will come back conclusive for the Sapir-Whorf hypothesis but all do help further understanding of language and perception. Studies will be done on both monolingual and bilingual speakers.

Keywords: *perception, bilingual*

Introduction

In the 1930's Edward Sapir and Benjamin Lee Whorf made a hypothesis, called the Sapir-Whorf hypothesis, that language molds the way people view space and time (Boroditsky, 2011). They also claimed that language also affects many other aspects of mental cognition. The Sapir-Whorf hypothesis mainly focuses on the verbal aspects of language, but written language is also considered to shape mental processes. The nuances between written languages such as direction of writing, left to right or right to left, or the usage of male and female nouns and verbs can alter one's perspective (Boroditsky, 2011). The way you use your language can also give you an advantage over other people in cognitive ability such as: math being easier for children using base-ten numbering systems, learning one's sex faster when using male and female nouns, or being better spatially aware when using cardinal directions (Boroditsky, 2011). Speakers of different languages may also view events differently from others. Bi-lingual speakers have been found to change their personality, actions, and perception when changing languages (Boroditsky, 2011). The Sapir-Whorf hypothesis states that the structure of a language affects the speaker's perception of the world. Through research it can be inferred that the Sapir-Whorf hypothesis can only be applied to abstract thoughts such as time and space but is a non consequitur to tangible objects or things based off personal preference.

Time Perception

The studies done are both based on the perception of time. The studies are stating that the way a language uses time, quantity or distance, will determine how accurate the speaker's perception is to reality. The use of quantity as time such as "much time" or "small time" will be compared to the use of distance as time such as "long time" or "short time."

Casasanto et al. (2004) Study

Three experiments were done to test distance vs quantity for time. Experiment one used Google's database to see what was searched more often amongst English, Indonesian, Greek, and Spanish speakers (Casasanto et al., 2004). The phrased used was "long time" and "much time." They found that English and Indonesian speakers used distance related terms for time more often than Greek and Spanish speakers, and Spanish and Greek speakers used quantity related terms for time more often (Casasanto et al., 2004). The cause for this is because the more common term used in each respective language is more common.

Experiment two tested 65 subjects from either English, Spanish, Indonesian, or Greek speaking countries. They showed each subject 162 lines one at a time growing at varying lengths (Casasanto et al., 2004). They were then asked for either the displacement of the line or the duration of time it took for the line to be completed. There were instructions placed so to ensured that distance related metaphors were not used. None of the displacement values were used in the data for this experiment. The results of the study found that English and Indonesian speakers were more accurate when asked about duration while Spanish and Greek speakers were less accurate (Casasanto et al., 2004).

Experiment three was done with 74 subjects of the same population as experiment two. The subjects were asked to look at 162 containers filing with water one at a time (Casasanto et al., 2004). They were then asked for either the quantity of water or the duration of time it took for the bottle to be full but never both. There were instructions placed so to ensured that quantity related metaphors were not used (Casasanto et al., 2004). None of the quantity values were used in the data for this experiment. The results of the study found that Spanish and Greek speakers

were more accurate when asked about amount of time passed while English and Indonesian speakers were less accurate.

Bylund and Athanasopoulos (2017) Study

The first two experiments done in this study were the same as experiments 2 and 3 in the study above (Bylund & Athanasopoulos, 2017). The difference was is that this study did not use verbal prompts during the experiment. Even still the finding is these experiments came out with the same results.

The third experiment tested Swedish-Spanish speaking subjects. They tested for the correlation of time as distance and time as quantity using the same method as the first study. The results showed that when using Spanish, the subjects were more accurate when viewing the bottle experiment than when viewing the line experiment, and when using Swedish it they were more accurate when viewing line experiment than when viewing bottle experiment (Bylund & Athanasopoulos, 2017).

Analysis of Studies

Both studies used the same method to test the Sapir-Whorf Hypothesis. Bylund's study goes more in depth because of the use of bilingual speakers. Both studies have proven that language does indeed alter the way people view space and time. This can also be attributed to Hebbian learning, which states that when using time-distance metaphors for time it strengthens the mapping in the brain for time and distance; the reverse is true for time-quantity metaphors as well. In both studies it is appropriate to say that the Sapir-Whorf Hypothesis can be applied to the perception of space and time because space and time use higher levels of cognition. The usage of bilingual speakers in Bylund's experiments better proves that speakers of different languages do perceive time differently.

Perception Based on Sight

The three studies done are based on how language changes the perception of objects and colors. The first study done is testing to see if color perception changes based on language. The second study is testing to see whether tangible objects a perceived differently based on language. The last study done is testing to see how language affects the way children view unknown objects.

Gibsona et al (2017) Study

The study was done to prove that language shapes the way people see color rather than color being universally shaped (Gibsona et al., 2017). The subjects came from a population of Spanish, English and Tsimané, indigenous people of lowland Bolivia, speakers to see the difference in color naming variability (Gibsona et al., 2017). The results of study found that Tsimané speakers had more color variability except for when seeing red. English and Spanish speakers used around the same amount of color variability when doing this test.

Boutonnet, Dering, Viñas-Guasch, and Thierry (2013) Study

In this study the researchers wanted to see if language changed the perception of objects. They used a population of Spanish and English speakers. The objects that were used were a cup, mug and bowl. Three different tests were done to see if there was a change in perception of these objects (Boutonnet et al., 2013). All tests done came back negative for the Whorf-Sapir hypothesis. The study although inconclusive did find that language does affect the categorization of objects.

Barner, Li, and Snedeker (2016) Study

In this study researchers are trying to prove that language does and does not change perception of objects. The study done is basing itself off of mass-count languages like English

(Barner et al., 2016). Mass-count is where you can give a number of something without giving a numerical value such as saying “some” or “a lot.” The population tested was Japanese, Chinse, and English speaking children. The difference between these languages is how the children learn new objects. English speaking children learn new objects as shapes and will refer to other objects the same way based on shape (Barner et al., 2016). While Japanese and Chinese speaking children will refer to new objects based on its substance and refer to other objects the same way based on substance. The experiments done wanted to see if children would use mass or count for a noun (Barner et al., 2016). The experiment would show children different objects with a different amount of each object on a screen. The idea was to show the children novel objects to see if they would use mass or count for the noun. The results of the study found that English speaking children used count nouns more often when the object was unknown (Barner et al., 2016); the reason for this is because of how ubiquitous the count nouns are in the English language. Japanese and Chinese children would choose to use mass or count nouns wen viewing the same unknown objects. The reason for this is because the shape and substance of the object was equally unknown to the children.

Another experiment was done on English-Mandarin speaking children. The experiment wanted to see how the children defined an object when changing languages (Barner et al., 2016). When the children define in English, they would extend words by shape more that when told to define in mandarin. This showed that linguistic cues make it more likely to extend novel words to objects, not the count syntax (Barner et al., 2016).

Analysis of Studies

All studies came back with a negative correlation to language and perception of objects/colors. These studies did find that language has a strong correlation to the label-feedback

hypothesis, stating that in learning to associate category names to objects that are similar, the label then becomes interlinked with the features that most fit the category. Furthermore, objects themselves are not shaped by language but language can change the way we categorize the objects in our minds. This would cause people to see objects from a different outlook but not really cause them to see the object any differently.

Emotional and Mental Perception

Four studies are done to test the mental cognition and perception of emotions of different languages. The first and second study where based on mental cognition and perception of personalities. The third study tested whether moral judgments would change based on test languages. The last study tested if a website was in a different language would it change the way people view the website.

Chen, Benet-Martínez, and Ng (2013) Study

Three studies were done with a population Chinese-English bilingual speaker. The subjects all spoke Chinese natively and learned English through school (Chen et al., 2013). The subjects were only picked if they could pass a literacy test. The study wanted to see if personality perception and cognitive ability would change when switching language from Chinese to English. Studies one and two were written while study three was done verbally (Chen et al., 2013). In study one the researchers wanted to see if there was a change in cognitive ability. The study found that when speaking Chinese, the subjects showed higher levels of logical thinking. Study two was a written test to see how the subjects perceived personalities of others. The results showed that there was an increase in personality perspectives when the subjects spoke in Chinese (Chen et al., 2013).

Study three was a double-blind test. The researchers wanted the observer to record how they perceived the subjects and vice-versa. The study found that when the subjects spoke in

Chinese, they used more personality variables than when speaking in English (Chen et al., 2013). The observers recorded that the personalities of the subjects would change upon switching languages.

Rojas, Gelso, and Bhatia (2013) Study

A study was done on Spanish-English bilinguals to see if their perception of a therapist would change if asked to switch language (Rojas et al., 2013). The researchers used multicultural competence of the therapist, the bond felt between therapist and subject, and subject's cultural identity, Hispanic or American culture, as a measure for the experiment (Rojas et al., 2013). The measures used for the test all came back inconclusive holding no correlation except for multicultural competence. The researchers found that the subjects with more American identity perceived the therapist more multiculturally competent when he/she switched languages (Rojas et al., 2013). The subjects with more Hispanic identification perceived the therapist the same in all cases even when language was switched.

Hayakawa, Tannenbaum, Costa, Corey, and Keysar (2017) Study

A study was done with English-Japanese speakers to see if moral judgment and utilitarianism would change when switching languages (Hayakawa et al., 2017). All participants learned English in a class setting and were required to pass a literacy test. A written test was done, in both languages, with questions such as "would you kill a person to save five other people?" (Hayakawa et al., 2017). The results found that when using foreign language, the subject exhibited less moral judgement and utilitarianism. Researchers conclude that the reason for this is because of the high demand on mind when using a foreign language (Hayakawa et al., 2017). When using a foreign language, it causes the subjects to feel less and think more.

Alcántara-Pilar, Barrio-García, and Rodríguez-López (2018) Study

A study was done with English-Spanish speakers to see if they would perceive a website with more or less risk, usability, and satisfaction (Alcántara-Pilar et al., 2018). The results found that when the website was in English the perceived risk was lower, usability was higher, and overall satisfaction was higher. The complete opposite was true for when the website was done in Spanish (Alcántara-Pilar et al., 2018).

Analysis of Studies

The study done by Chen et al (2013) cannot be used to disprove or prove the Whorf-Sapir hypothesis because the use of bilinguals that were not fluent in their second language makes the tests done flawed. In the Rojas et al (2013) study there is no strong proof that language causes change in perception of personality because anyone who uses two language can be seen different because of that reason alone; just as person that can solve a Rubik's Cube will seem smarter when in reality they may not be. The Hayakawa et al (2017) study disproves itself when they mention that the reason for change of moral judgment was because of the stress put on the brain wen using a foreign language. The study done by Alcántara-Pilar et al (2018) study also is non-applicable to the Whorf-Sapir hypothesis because there could be cultural reasons for the perception of website risk, usability, and satisfaction. Even though all studies do not help prove the Whorf-Sapir hypothesis one experiment done by Chen et al (2013) could have some evidence that when changing language personality changes; the third experiment done in this study stated that the subjects in the study would change personality when changing languages. This shows that not only outward perception changes but inward perception changes in way that the speaker may not notice.

Number Perception

Two studies were done to test to see if numbers perception would change based on language used. The first study tested children to see if using different numbering systems would change mental cognition. The second study tested to see if giving a label to a pattern would change the reaction time of the participants.

Pixner, Moeller, Hermanova, Nuerk, and Kaufmann (2011) Study

In this study children were tested to see if children would change numbering systems based on language, Arabic numbering system (Pixner et al., 2011). The results of the test showed that when the children were asked to use a numbering system that did not match the same numerical structure of the test language, Arabic, were much slower than those that did (Pixner et al., 2011). In this study they also found that children using the English numbering system had a harder time learning math because of the numbers 11-19 (Pixner et al., 2011). The reason for this is because these numbers do not match the pattern used in the rest of the numerical alphabet.

Klemfuss, Prinzmetal, and Ivry (2012) Study

In this study two experiments were done, the researchers wanted to prove that visual perception is not based on looks but on the meaning of the visual stimulus (Klemfuss et al., 2012). Experiment one consisted of 4 groups. Two groups were told to look at a screen and to find the pattern that was not alike. These groups were told that the patterns were rotated 2's and 5's. The other two groups were told that the patterns were abstract. Any of the subjects that labeled the abstract shapes were not included in the research (Klemfuss et al., 2012). The results found that those who were told shapes were abstract were slower at finding the odd pattern than those who were told that the shapes were 2's and 5's.

In experiment two the amount of time taken for subjects to find the odd thickness with in a group of rotated 2s and 5s was tested (Klemfuss et al., 2012). The test would for have the numbers upright and then again with numbers turned horizontally. The results of the test found that when viewing number upright it slowed down reaction time because lexicon coding interrupts the thought process for finding thickness (Klemfuss et al., 2012).

Analysis of Studies

The first study proves that language can be advantageous to cognitive ability. This has a weak correlation wit h the Sapir-Whorf hypothesis because the language can change the way math is perceived amongst children. In the second study proves that when attributing a label to an object it can change the way it is then perceived. When subjects were asked to view objects as numbers it made it took longer for subjects to recognize thickness because the mind was too busy worrying about lexicon coding.

Conclusion

The Sapir-Whorf hypothesis can be applied to higher level thinking; other things that require lower level thinking are universal. All of the studies that I have reviewed further prove the Sapir-Whorf hypothesis. Even though some of the studies done came back inconclusive it still gives a guide of where the Sapir-Whorf hypothesis can be applied. What is known is that language directly affects time. Language affects the way objects and other visual stimuluses indirectly; In that, language will change the way people categorize objects based on the meaning given in their respective language. Many other studies have been done on different areas of perception that were not reviewed in this paper. In other studies, the researchers found that some children learn sex faster when their langue requires them to use masculine and feminine pronouns. Police reports found that people who speak different languages will remember

different parts of an accident; this is based off of how the language is used to identify the victim and/or the aggressor.

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