**Linguistic Relativity and the Sapir-Whorf Hypothesis.**

*The influence of language on cognition and the implications for Second Language Acquisition and Bilingualism.*

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Declaration

I hereby declare that this thesis is entirely my own work and that it has not been submitted as an exercise for a degree at any other university.

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Abstract

The purpose of this paper is to investigate the Sapir-Whorf Hypothesis of Linguistic Relativity which states that the language we speak affects our cognition. It considers the original hypothesis by reviewing the “classical” literature and the history of the hypothesis. It then considers very recent research and the conclusions drawn from this research. Much of the recent research deals with the hypothesis in relation to Second Language Acquisition and Bilingualism, and the relationship between language and cognition in these areas. Thus this thesis looks at this area with experiment undertaken by other researchers which seem to support the idea of linguistic relativity. There are two experiments carried out in this paper, one which replicates a previous study on grammatical gender and another which considers the syntactic differences between Irish and English. These experiments did not reveal any support for Linguistic Relativity that was statistically significant. However, there are some suggestions for future work which include some possible improvements for the experiments.
“Since ‘tis Nature's law to change, Constancy alone is strange.”
JOHN WILMOT

"Language shapes the way we think, and determines what we can think about."
BENJAMIN LEE WHORF

“Language is not only the vehicle of thought, it is a great and efficient instrument in thinking.”
HUMPHRY DAVY

“Language screens reality as a filter on a camera lens screens light waves”
CASEY MILLER AND KATE SWIFT

“Change your language and you change your thoughts.”
KARL ALBRECHT

“The limits of my language mean the limits of my world”
LUDWIG WITTGENSTEIN

“It's a strange world of language in which skating on thin ice can get you into hot water.”
FRANKLIN P. JONES

“Language is the blood of the soul into which thoughts run and out of which they grow.”
OLIVER WENDELL HOLMES

“If you can speak three languages you're trilingual. If you can speak two languages you're bilingual. If you can speak only one language you're an American.”
ANON
Chapter 1
Introduction
1.1 Aims and Intentions

The aim of this project is to investigate the Sapir-Whorf Hypothesis of Linguistic Relativity which states that there is a relationship between language and cognition. This investigation will consider the original hypothesis, more recent research and the implications of these types of research for Second Language Acquisition and Bilingualism. I will also implement two experiments of my own to see if they will yield similar results to previous experiments undertaken.

1.2 Motivation

The theory of Linguistic Relativity is one which has been discussed and researched for many years. Ideas relating to Linguistic Relativity can be found as far back as the works of Plato, Aristotle, Socrates and de Saussure. Indeed it is an area which continues to have a certain appeal for linguists today. There has been a lot of research which compares the cognitive processes of speakers of different languages, but these days many people speak more than one language. Therefore, it would be interesting to look at the Relativity Principle in relation to bilinguals and learners of more than one language.

1.3 Overview

Chapter 2 focuses on the origins of the Linguistic Relativity Principle. It looks at the work of Humboldt, Boas, Sapir and Whorf and considers their ideas regarding Linguistic Relativity

Chapter 3 focuses on some of the more recent work by Neo–Whorfianists such as John Lucy and Dan Slobin. It takes an in depth look at some research by John Lucy comparing American English speakers’ and Yucatec Maya speakers’ reactions in tests choosing between shape and material alternates. There is also reference to Stephen Pinker and his view that the Whorfian hypothesis is wrong.
Chapter 4 looks at recent research for the implications of Linguistic Relativity for Second Language Learners and bilinguals. It outlines a number of experiments undertaken by researchers in this area.

Chapter 5 deals with a set of experiments that I undertook myself. They test participant’s reactions in areas of grammatical gender and syntactic structure of their languages to see if there is any evidence for a relationship between language and thought.

Chapter 6 is a concluding chapter. It discusses the research presented in this thesis, draws some conclusions and looks at possible future work which could be carried out in this area.
Chapter 2
The Sapir Whorf Hypothesis
2.1 Introduction

The grammar system of a language can be described as the underlying structure of a language; this system is a mixture of all the rules that make up a particular language. All languages have their own distinct grammar system, and it is this which differentiates it from other languages. The following section takes a look at the origins of the Sapir-Whorf Or Whorfian Hypothesis, which has now become known as the Linguistic Relativity Principle. It accounts for differences in cognition based on different languages.

2.2 Definitions.

The following are some definitions which are important to know for the purpose of this thesis.

2.2.1 Linguistic Relativity

Linguistic Relativity is the idea that the language a person speaks shapes and influences they way they think.

Edward Sapir wrote that:

“No two languages are ever sufficiently similar to be considered as representing the same social reality.”

(Sapir 1958 [1929]:69)

2.2.2 Linguistic Determinism

Linguistic Determinism is the idea that the things a person thinks are fully determined by the language that they speak.
These two ideas can be classed as the strong and weak versions of the Linguistic Relativity Hypothesis or Principle.

2.3 The Origins of the Hypothesis

The relationship between language and thought has been referred to by various scholars throughout time including Plato, Socrates, Aristotle and de Saussure In 18th century Germany, scholars such as Machaelis, Johann Gottfried Herder and Johann Georg Hamann concerned themselves with the ideas of language and thought (Lucy 1992:1). Their ideas were continued in the work of Wilhelm von Humboldt, Franz Boas, Edward Sapir and Benjamin-Lee Whorf to make up what has now become known as the Linguistic Relativity Principle.

2.3.1 Wilhelm von Humboldt.

Wilhelm von Humboldt (1767-1835) was a well known German philosopher and linguist in the 19th century. He concerned himself with: “language studies, linguistic philosophy and education in general” (Koerner 2007:265). Humboldt is credited as being one of the first people to indicate a relationship between language and mind with his Weltanschauung or ideology, known as the Weltansicht or world-view hypothesis; “he was … the first to emphasize the magnitude between cultures as revealed in their languages” (Penn 1972:19). Humboldt followed the belief that speakers of different languages have varying views of the world we live in (Koerder 2007). The following quote from his 1812 work Essai sur les langues du Nouveau Continent gives us a clear indication of his viewpoint:

« le monde dans lequel nous vivons est […] exactement celui dans lequel nous transplanter l’idiome que nous parlons »

“the world in which we live… is exactly that into which the language we speak transplants us”

(Humboldt 1812 quoted in Koerner 2007:272)
This theory became known as Humboldt’s Weltanschauungstheorie which he expanded upon throughout much of his following work. For him both language and thought were almost interchangeable, they were inextricably linked (Penn 1972:20).

“Die Sprache ist durchaus kein blosses Verständigungsmittel, sondern der Abdruck des Geistes und der Weltansicht des Redenden”
“Language is by no means a mere means of communication, but the mirror of the mind and of the world view of the speaker”
(Humboldt from Gesammelte Schriften VI, p.23 quoted in Koerner 2007:272)

The following is an extract from what is considered to be his fundamental work in this area.

“… there resides in every language a characteristic world-view. as the individual sound stands between man and the object, so the entire language steps in between him and the nature that operates, both inwardly and outwardly, upon him. He surrounds himself with a world of sounds so as to assimilate and process within himself the world of objects. These expressions in no way outstrip the measure of the simple truth. Man lives primarily with objects, indeed, since feeling and acting in him depend on his presentation, he actually does so exclusively, as language presents them to him.”
(Humboldt 1988 [1836]:60 quoted in Koerner pg 273)

The view expressed by Humboldt is quite rigid. He believed that language and thought came hand in hand, and thus one could not exist without the other (Penn 1972:20). He seems to support the idea of linguistic determinism i.e. that the language we speak fully determines our thought. However, it is important to note that he never expressly ruled out the idea purported by linguistic relativity, that language influences cognition.
Franz Boas (1858-1942) was an anthropologist who contributed to “physical anthropology, social and cultural anthropology, and linguistic anthropology” (Lucy 1992:11). Boas made many references to the differences across languages; he claimed that language played a part in culture. He outlined this belief in three steps, firstly that “languages classify experience” (Lucy 1992:11); secondly, that different languages will have a different classification of the same experience; i.e. it can lead to different experiences of the same event (Lucy 1992:12). His most cited example of this was that of the Eskimo, and their various words for snow. He mentions four lexically unrelated words for the term snow in Eskimo; aput which means snow that’s on the ground, qana which is falling snow, piqsirpoq which refers to drifting snow, and qimuqsuq which refers to a snow drift (Martin 1986:418). This example was later used by Whorf as an illustration of the Linguistic Relativity Hypothesis. Boas’ third claim was that these varying experiences of the same events due to language remained unnoticed by the speakers of a language because of the automatic nature of language (Lucy 1992:13).

It is important to note that Boas fundamental claim was that the linguistic classifications reflect the thought of a language’s speakers; but that they do not dictate the “conceptual ideas and forms of thinking of a culture” (Lucy 1992:13). Another thing to know is that Boas didn’t stick to one opinion on the nature of the relationship between language and thought; he was never explicit in his opinion (Lucy 1992:13-14). Boas echoed the view presented by Humboldt but according to Koerner: “he was hedging, allowing for a possible reciprocal influence between language and thought (which was not actually excluded by Humboldt)”, (Koerner 2002:273). Lucy states that towards the end of his life Humboldt tentatively presented “the possibility of a shaping role for language in thought and culture” (Lucy 1992:17).
2.3.3 Edward Sapir

Edward Sapir (1884-1936) was a student of Boas’ at Columbia University. In his work, Sapir followed on from Boas’ arguments and work in a number of ways. He believed that languages were complete systems and they were a means through which thought could be accounted for.

“It is, indeed, in the highest degree likely that language is an instrument originally put to uses lower than the conceptual plane and that thought arises as a refined interpretation of its content”

(Sapir 1949e [1921], pp 14-15 quoted in Lucy 1992:20)

We can see from the above that Sapir did not consider language and thought to be the same thing, in fact according to Lucy he explicitly stated the opposite (Lucy 1992:20). He did however; dismiss the idea of being able to think without language which partly echoes the view presented by Humboldt. He believed that “language is not the creation of human thought” (Penn 1972:24) like Humboldt but that they are not identical, just quite similar. In fact, Sapir did indeed support the extreme version of linguistic relativity i.e. linguistic determinism at some stage in his work (Penn 1972:28).

Sapir also supported the linguistic relativity principle. He was a proponent of the belief that culture influenced language, believing that this influence was more on a vocabulary level than on a morphological one (Lucy 1992:21). He detailed his support of the linguistic relativity principle by stating that:

“No two languages are ever sufficiently similar to be considered as representing the same social reality. The worlds in which different societies live are distinct worlds, not merely the same world with different labels attached”.

(Sapir, 1949h [1929], p. 162 quoted in Lucy 1992:22)
2.3.4 Benjamin Lee Whorf

Benjamin Lee Whorf (1897-1941) was a chemical engineer who worked as a fire prevention engineer/inspector for the Hartford Insurance Company. He developed an interest in anthropology and linguistics at this time for many reasons. His initial contact with linguistics was through self-instruction, but after 1931 he came to know Edward Sapir and worked under him. It is claimed that this is how his interest in the area of linguistic relativity arrived (Lucy 1992:25). Another possible explanation was his exposure to situations which caused problems and misinformation due to the language used, like in the following example. While working in fire prevention Whorf noticed, amongst other things, that people would smoke near containers which were labelled as ‘empty’ oil drums. These drums still contained dangerous gases and were probably more volatile than when they were when full. It was his belief that by using the word ‘empty’ it determined people’s reactions to the object. He said that:

“Physically the situation is hazardous, but the linguistic analysis according to regular analogy must employ the word ‘empty’, which inevitably suggests lack of hazard”.

(Whorf 1956:135)

Whatever the reason, it is certainly evident that this was an area which Whorf was interested in and he spent many years researching the possibility of linguistic relativity.

Apart from the examples of people being misled by the language used in a certain situation, which he collected during his work as fire prevention engineer; he also undertook extensive research on the Hopi language and other Amerindian languages which were based on the structure of these languages. He compared the differences in how Hopi and Standard American English (SAE) considered time and space.

“Our own “time” differs markedly from Hopi “duration”. it is conceived as like a space of strictly limited dimensions, or sometimes as like a motion upon such a space, and
employed as an intellectual tool accordingly. Hopi “duration” seems to be inconceivable in terms of space or motion being the mode in which life differs from form, and consciousness in toto from the spatial elements of consciousness. Certain ideas born of our own time-concept, such as that of absolute simultaneity, would be either very difficult to express or impossible and devoid of meaning under the Hopi conception, and would be replaced by operational concepts.”

(Whorf 1956:158)

This example, amongst others he found in the differences between Hopi and SAE, was used by Whorf as support for the theory of linguistic relativity. He details what he believed linguistic relativity was in the quote below, which indicates his focus on the differences in grammatical structures in languages.

“From this fact proceeds what I have called the “linguistic relativity principle,” which means, in informal terms, that users of markedly different grammars are pointed by their grammars toward different types of observations and different evaluations of externally similar acts of observation, and hence are not equivalent as observers but must arrive at somewhat different view of the world”

(Whorf 1956:221)

He believed that the main influence that language has on thought is where “speakers take (i.e., appropriate) language patterns as guides to the nature of reality” (Lucy 1992:46). The following diagram is an attempt by Lucy to represent Whorf’s argument.
Lucy explains the diagram by stating that “some aspect of a “situation” is immediately and subjectively “experienced” by a speaker of a particular language….. His subjective experience then becomes colored by his language yielding “linguistically conditioned habitual thought”” (Lucy 1992:47).

2.4 Other support for Linguistic Relativity

Although fictional the Newspeak language, created by George Orwell in his novel 1984, aptly demonstrates the effects a language can have on cognition. It is described in the novel as being “the only language in the world whose vocabulary gets smaller every year”. The aim of Big Brother and the Party, the dictators in the novel, was to use Newspeak as a means to control the thoughts and therefore the actions of the population. They wanted to remove any words or references to freedom, rebellion, free speech etc. as part of this control. The following quote from the book explains the principle behind Newspeak. Oldspeak in this quote refers to Standard English.
“By 2050—earlier, probably—all real knowledge of Oldspeak will have disappeared. The whole literature of the past will have been destroyed. Chaucer, Shakespeare, Milton, Byron—they'll exist only in Newspeak versions, not merely changed into something different, but actually contradictory of what they used to be. Even the literature of the Party will change. Even the slogans will change. How could you have a slogan like "freedom is slavery" when the concept of freedom has been abolished? The whole climate of thought will be different. In fact there will be no thought, as we understand it now. Orthodoxy means not thinking—not needing to think. Orthodoxy is unconsciousness.”

(Orwell 1949:54 (depending on publication))

A similar example is found in the French science fiction film ‘Alphaville, une étrange aventure de Lemmy Caution’. The film is based in the futuristic city of Alphaville which is dictated by a computer known as Alpha 60. This computer outlaws the notions of free thought and any individualist concepts such as poetry, love and emotion. Every room in Alphaville contains a Bible which is in fact a dictionary of words which have been banned because they are deemed to evoke emotion. This results in the population of Alphaville resembling mindless drones (Wikipedia & IMDB information on Alphaville).

These examples, although fictitious, give us an idea of the possible control that language may have on cognition. They show us a nightmare world where the influence of language on cognition is used as a tool for control and coercion.
Chapter 3

Neo-Whorfianists and their Research
3.1 Introduction

The Linguistic Relativity Principle remains a hot topic in current research, the relationship between language and cognition is one which is often explored by linguists. This chapter will outline and review some of the research that has been undertaken and conclusions which have been drawn from them relating to Linguistic Relativity. All of the examples used are taken from the work of the linguist in that section. Many of the linguists who spend their time researching in this area have been dubbed Neo-Whorfianists, as they follow on from the work made famous by Whorf himself.

3.2 John Lucy

3.2.1 Introduction

John Lucy is perhaps one of the better known Neo-Whorfianists. He has spent a considerable amount of time studying Yucatec Maya (a non-plural marking language), which is an indigenous Mayan language of south-eastern Mexico and American English (Lucy 2004:7). His intensive studies and research focus on the structural differences between the two languages, and attempting to see if these differences can account for any effect on cognition in their speakers. He states that his work:

“…builds on analyses of multiple morphosyntactic structures within a typological framework; it uses a range of cognitive assessments using different stimulus materials and cognitive tasks; and it examines both adult and child performance.”

(Lucy 2004:7)

In his resulting experiments, Lucy focuses on the treatment of nominal number marking patterns in both languages as the focal point. He states that the two languages differ in the way that they pluralize nouns. English has a split pattern when pluralizing objects; it will pluralize nouns that are “semantically marked as referring to discrete
objects” e.g. car; whereas nouns which refer to objects with no distinct shape e.g. sugar do not signal plurality. On the other hand, Yucatec Maya has a continuous pattern i.e. speakers are never obligated to signal plurality for any particular referent. However, Lucy makes the point that many speakers of the language do signal plurality and they “often do mark it for animate referents” (Lucy 2004:7). Another area he looks at it in both languages is how they enumerate nouns. English again has a split pattern; numerals which are used with a noun which has been marked as having a “semantically discrete reference” (Lucy 2004:7) modify the noun itself e.g. one candle, two candles. For those which are not marked in this way then a unit or “unitizer” must be used which will then take the number marking e.g. one clump of dirt. Yucatec has a continuous pattern for enumerating nouns i.e. all constructions with numerals must have a special form with it; these are referred to as numerical classifiers. He says that by choosing numeral classifiers it:

“reflects the fact that all nouns in Yucatec are semantically unspecified as to quantificational unit-almost as if they referred to unformed substances”

(Lucy 2004:8)

These forms typically provide information about the shape or material properties of the object e.g. un-tz’üit kib which means one long thin candle (Lucy 2004:8); Lucy points out that kib in the sentence above translates closer to wax than to candle, but if it’s on its own and without a numeral modifier for conditions other than enumerations then it could refer to what we would commonly call a candle. He explains that this is why we have to use a unit, like a classifier, when counting with expressions such as this; because otherwise they wouldn’t make any quantificational sense in Yucatec (Lucy 2004:8). English, on the other hand, uses the notion of a quantificational unit as part of the fundamental meaning, “we can use the numeral directly without any classifiers (e.g. one candle)”. From this Lucy concludes that English only requires this type of unitizing construction for some nouns whereas in Yucatec it is required for all nouns (Lucy 2004:8).
In order to test these differences in the languages and to see if there were any resulting differences in cognition amongst their speakers, Lucy carries out two experiments based on these number marking patterns which will test to see if these contrasting patterns have any impact on the speakers’ cognitive abilities and activities.

3.2.2 Experiment with stable objects

The following is a summary of experiments carried out by John Lucy and Suzanne Gaskins.

3.2.2.1 Predictions and Expectations

First, he carried out an experiment, with Suzanne Gaskins (Lucy & Gaskins 2001), which would test the reaction of speakers of both languages to stable objects, i.e. objects which retain their physical appearance over time. He says that English nouns which refer to objects like this will presuppose to shape as the quantificational unit of the object; whereas Yucatec lacks this sort of quantificational unit and will thus often focus on the material of the object. Lucy uses this knowledge to make some predictions for his experiment. He states that when presented with a pivot object and two alternative objects and asked to choose the object which is more like the pivot one, English speakers will choose the alternative based on shape whereas Yucatec speakers will tend more towards material similarities; and that their choices are based on the treatment of these objects in their language (Lucy 2004:11).

3.2.2.2 Methodology

He tested these predictions with both child and adult speakers of both languages. Fifteen triads of objects were given to twelve speakers of each group. These objects were familiar to both groups and were naturally occurring; they were all controlled for size, colour, function, wholeness and familiarity. The triads consisted of an original pivot object and then two alternatives, one of which was a shape alternative and the other a
material alternative. An example of the kind of triad used is: speakers were shown a plastic comb with a handle as the pivot object. The alternative choices were a wooden comb with a handle and a plastic comb with no handle.

3.2.2.3 Results

The results from these triad tests strongly verified the predictions relating to preference of classifier. Adult speakers of English chose the material choice only 23% of the time compared to Yucatec speakers who chose it 61% of the time. This points to the fact that the adult groups are classifying objects based on the grammatical structures of their language. With regard to the group of children, both English speaking and Yucatec speaking seven year olds tended to choose shape over material, with material only being chosen 12% of the time. By the age of nine, the choices presented seemed to be more in line with those given by the adult participants; English-speaking children chose material alternates 18% of the time compared to 42% provided by Yucatec-speakers. These results are all statistically reliable based on tests carried out by Lucy and Gaskins.

Figure 2. Developmental pattern for English and Yucatec classification preferences with stable objects: material versus shape

(Lucy 2004:13)
3.2.3 Experiment with malleable objects

The following is also an experiment carried out by John Lucy and Suzanne Gaskins.

3.2.3.1 Predictions and Expectations

The second experiment carried out tested the reaction of speakers of American English and Yucatec Maya to malleable objects, i.e. objects that can remain together outside of a container e.g. a squeeze of toothpaste. These types of objects can change shape depending on the circumstance, thus according to Lucy participants of both languages should classify the objects by material rather than shape; as there is no presupposed quantificational unit for them. Thus both groups should react in similar ways when classifying the objects.

3.2.3.2 Methodology

This experiment was also carried out on both child and adult groups using a triad-classification task like the one in the previous experiment. Participants were shown six triads which had a pivot and alternatives all made up of different materials e.g. foams, creams, gels, pastes, powders, particles or granules. These items were then formed into shapes, both the materials used and the shapes they were formed into were common to both groups. However, Lucy mentions that the combination of these types of materials in particular shapes was new for all participants. An example of the kinds of triads used is a square of coffee granules as the pivot object and a choice between an oval of dirt and an oval of coffee as the alternative choices.

3.2.3.3 Results

As expected both groups tended to choose material over shape, with adult Yucatec speakers choosing material 53% of the time and adult English speakers choosing them 34% of the time. Lucy states that even though the direction of contrast is similar to
that found with the previous experiment, i.e. Yucatec favouring material over shape more often than English speakers, he points out that this is not statistically reliable. Thus it gives a result as expected, that both groups would choose material objects more often than shape. In relation to the children who participated, both Yucatec and English speaking seven year olds chose material alternates more often. English-speaking children favoured them 42% of the time and Yucatec-speaking children chose them 46% of the time. There was very little change in the results for children aged nine; i.e. English-speaking nine year olds chose material 43% of the time and Yucatec chose them 50% of the time. As a result, one can see that the results for adult and children with malleable objects are similar.

Figure 3. Developmental pattern for English and Yucatec classification preferences with malleable objects: material versus shape

(Lucy 2004:15)

**3.2.4 Discussion and Conclusions**

There are three main conclusions that Lucy draws from these experiments. Firstly he discusses how the results for adults seem to depend on how the speakers treat the particular objects in their language, “the nonverbal classification behaviour follows the
language pattern” (Lucy 2004:15). Where the two languages have similar grammatical treatment of the objects, i.e. with malleable objects, they both seem to behave in a similar way with regard to their preference for material classification. However, when the two languages disagree i.e. in their treatment of stable objects, the participants choose either material or shape as a result of the differences in their languages.

With regard to children, he mentions that seven year olds seem to show “sensitivity to referent type independently of language group membership” (Lucy 2004:15). They seem to choose material as the classifier for malleable objects and shape as the classifier for stable objects. This seems to show that language type is not a dominant factor in these tasks for children of this age. This is supported by other work carried out on children in relation to grammatical gender tasks. An experiment carried out by Flaherty (2001 quoted in Bassetti 2007:257) on English and Spanish children and adults found that “grammatical gender affected children above eight and adults, but not children aged five to seven” (Bassetti 2007:257). Nevertheless, children aged nine do show some sensitivity to referent type based on their language, they react in similar ways to the adult participants. Lucy claims that “this suggests that language categories increase in their importance for cognition between ages seven and nine” (Lucy 2004:16).

Finally he declares that there are some similarities in the adult responses which seem to point to a pattern for each group. English speakers seem to tend towards responses based on shape and Yucatec responses are more based on material. Thus he comes to the conclusion that:

“the two groups begin by grouping different referent types in the same ways as a function of language type.”

(Lucy 2004:16)

The following diagram outlines the results of both tests.
3.2.5 Implications for Linguistic Relativity

Lucy asks the question if the results of these experiments point towards a “real” linguistic relativity. He says that the results don’t ever reach 100 percent for either group; thus they support the weaker version of the hypothesis, that language influences thought and doesn’t determine it.

“The view taken here is not that languages completely or permanently blind speakers of reality. Rather, they provide speakers with a systematic default bias in their habitual response tendencies, especially in ambiguous situations such as we have created with our tasks and as often arise in everyday life…. For the moment, we can say we have evidence that language
structures bear some relationship to thought, that the direction appears to be from language to thought, and the relationship appears to be robust”

(Lucy 2004: 18-19)

3.3 Dan Slobin

Dan Isaac Slobin is a psychologist working at the University of California, Berkeley. He specialises in the areas of cognitive and developmental psycholinguistics. Slobin has suggested that in the area of language and thought, these words should be replaced with *thinking* and *speaking*. Thus he postulates the notion of *thinking for speaking*. He states that the change in words is to bring attention to the “mental processes that occur during the act of formulating an utterance” (Slobin 1996:71). He believes that there is a special type of thinking that occurs in relation to thought “namely, the thinking that is carried out, on-line, in the process of speaking” (Slobin 1996:75). It also “involves picking those characteristics of objects and events that (a) fit some conceptualisation of the event, and (b) are readily encodable in the language” (Slobin 1996:76).

This idea differs from the idea of linguistic determinism as presented by Whorf but it is related to the idea of linguistic relativity. According to McNeill and Duncan:

“Slobin outlined three approaches to demonstrate linguistic relativity in this thinking-for-speaking sense. One is to find the stages at which children talk about experience in ways that appear specifically shaped by the linguistic system they are acquiring; another is to identify the difficulties that second language learners have in adapting their thinking to the new language; the third is to look at languages historically -- the elements most resistant to change being possibly those most deeply ingrained in thought.”

(McNeill & Duncan 1998)
3.4 Other neo-Whorfianists

There are many other neo-Whorfianists to be discussed in this paper, but as their research focuses on the area of bilingualism and second language acquisition their work is described in the next chapter.

It is important to note that there are some linguists who dismiss the Whorfian view out of hand. One such linguist is Stephen Pinker.

3.5 Stephen Pinker

Stephen Pinker is a professor in the Department of Psychology at Harvard University. He carries out research in the areas of language and cognition. With relation to linguistic relativity, Pinker is not convinced with the ideas put forward by Whorf. He states that the:

“The famous Sapir-Whorf hypothesis of linguistic determinism….

Is wrong, all wrong…..The idea that thought is the same thing as language is an example of what can be called a conventional absurdity… There is no scientific evidence that languages dramatically shape their speakers’ ways of thinking.”

(Pinker 1994)

He continues with this claim by stating that the example Whorf uses of the ‘empty’ gasoline drums is not necessarily a result of the semanticity of the word ‘empty’.

“… the more you examine Whorf’s arguments, the less sense they make. Take the story about the worker and the “empty” drum. The seeds of disaster supposedly lay in the semantics of empty, which, Whorf claimed means both “without its usual contents” and “null and void, empty, inert”. The hapless worker, his conception of reality molded by his linguistic categories, did not distinguish between “drained” and “inert” senses, hence, flick, … boom! But wait. Gasoline vapor is invisible. A drum with
nothing but vapor in it looks like a drum with nothing in it at all.
Surely this walking catastrophe was fooled by his eyes, not the
English language.”

(Pinker 1994:60 quoted in Lee pg 154)

Further to these claims, he says that any favourable results which have been obtained from experiments testing the Whorfian hypothesis are “hardly surprising”.

Chapter 4

Implications for Second Language Acquisition and Bilingualism
4.1 Introduction

As can be seen throughout this thesis, the Linguistic Relativity Principle is something which a lot of linguists concern themselves with. It is a “hot” topic in current linguistic research particularly in the area of second language acquisition and bilingualism. We have seen that there is some support for the weaker version of the hypothesis, i.e. that language influences thought and that speakers of different languages will have different cognitive processes, but is this the same for people who speak more than one language? In essence will having more than one language at a person’s disposal affect their “world-view”? Will they be more inclined to think in the same way as monolingual speakers of their native language? Or will their cognitive processing lean towards that of their second language? How does this work in people who speak multiple languages, i.e. more than two? The following chapter hopes to investigate this area by looking at some very recent research.

Vivian Cook makes some interesting observations in relation to what may happen in the cognition of a person who speaks more than one language and whether or not they will acquire the concepts of this L2. He outlines four possible outcomes.

1. L2 concepts are not acquired. The L2 user acquires only the language and uses L1 concepts with the L2.
2. The two sets of concepts exist in separate compartments. The L2 user can switch between two thought systems when necessary.
3. The two sets of concepts are integrated to some extent. The two languages partially overlap in their concept-systems in the mind of the L2 user.
4. A new conceptual system has been created. The L2 user neither thinks like their L1 native speakers nor like L2 native speakers.

(Cook 2003:138)

These are interesting possibilities relating to how an L2 learner relates languages within their mind, if at all. He also asks how the term ‘concept’ is defined. We will use the definition given by Pavlenko for the purpose of this paper. She states that concepts are
“mental representations which affect individuals’ immediate perception, attention and recall” and allow “identification, comprehension, inferencing, and categorization” (Pavlenko 2002:70 quoted in Cook et al. 2006:139).

4.2 Definitions

Before we can look into this area, it is important that we present some definitions for bilingualism and monolingualism in order to be clear about what is meant in this paper. Vivian Cook states there is a problem with the definition that we choose for a monolingual and/or a bilingual. He says that monolinguals are difficult to find these days as most people have encountered more than one language in their lifetime. However, he also states there are issues with finding a perfectly balanced bilingual; to solve this issue he refers to people with a second language as an “L2 user” regardless of their level of proficiency in the L2.

4.2.1 Monolingualism

The Collins online dictionary defines the term monolingual as “knowing or expressed in only one language”. Elizabeth Ellis states that:

“It is now accepted by many that bilingualism is best regarded as a continuum (Haugen, 1969) and it follows that the point on the continuum, which separates a bilingual from a monolingual will vary according to the interests and focus of those proposing it.”

(Ellis 2006:174-175).

For the purpose of this paper, the term monolingual will refer to someone who is proficient in only one language. This means that if a person has a slight or superficial knowledge of a language, they are still deemed monolingual because they are unable to communicate more than a few words in another language.
4.2.2 Bilingualism

There doesn’t seem to be any particular agreed meaning for the term *bilingual* in the field of linguistics. Definitions tend to differ from person to person, and it can be quite difficult to find a definition which will satisfy all concerned. Is a bilingual someone who can communicate in more than one language? Or is it more specific than that? Is a bilingual someone who is fluent in more than one language? If this is the case then how do we define fluency? Bloomfield defines a bilingual as someone who has “native-like control of two languages” (Bloomfield 1933). The Collins online dictionary defines a *bilingual* as someone who is:

1. able to speak two languages
2. expressed in two languages

For the purpose of this paper we will use the term bilingualism to refer to anyone who proficiently speaks two or more languages; i.e. they can communicate more than the basic ‘Hello, Goodbye, Thank you’ limited use of a language. We will also be referring to bilinguals when using the term L2 user.

4.3 Vivian Cook et al.

Vivian Cook is a Professor of Applied Linguistics at Newcastle University. He is known for his research in the areas of first and second language learning, language teaching methodology, linguistics and EFL. He has carried out some research in the area of linguistic relativity, including the following which he undertook with Benedetta Bassetti, Chise Kasai, Miho Sasaki and Jun Arata Takahashi.

The following experiment tests shape and material in Japanese L2 users of English.
4.3.1 Methodology

There were 36 Japanese bilingual participants who were divided into two groups. One of 18 people who had lived in an English speaking country up to 2 years and 11 months and the other a long-stay group which was made of people who had lived in an English speaking country for 3 years or longer. The materials used were replicated from an experiment undertaken by Imai and Gentner (1997). There were three types: complex objects – factory-made artefacts that have a complex shape and a specific function, simple objects – made out of a solid material and substances – nonsolid materials arranged in a simple shape. Participants then had to choose between shape and material for each item that was presented, a triad choice system (having a main object and then choosing between two alternates for the best match). There were 12 triads altogether and each item was given a nonsense name to refer to it. The participants were told that they were taking part in a word learning task; they were given the name of an item and then asked to choose whichever of the other two they thought would have the same name.

4.3.2 Expectations

They expected to find that there would a difference in categorization between Japanese speakers who knew English and those who didn’t. More specifically, it was expected that the number of shape-based choices of simple objects would increase in Japanese L2 users, based on their experience of English. They also said that the shape and material preferences in the Japanese L2 users would be different to those found by the Japanese monolinguals and the English monolinguals in Imai and Gentner’s study.

4.3.3 Results

The overall results are demonstrated in the table below.
Thus we can see that responses for the complex objects were predominantly shape based, and the results for both simple objects and substances were predominantly material based. As a result, they conclude that these results reflect the expectations from Imai and Gentner’s report (1997) that Japanese speakers would choose shape for the complex objects and material choices for the other two. These are the results for the Japanese L2 learners as a whole; they were then split into the two groups – short stay and long stay – in order to see if this had any significance. These results were then compared with the monolingual results found in the original experiment by Imai and Gentner. It was found that:

“The comparison revealed that, while both groups of Japanese users of L2 English showed the same preferences as the Japanese monolinguals, the classification preferences of the long-stay bilingual group did not differ significantly from the English monolinguals for substances, and differed from the English monolinguals but much less than the short-stay bilingual group for simple objects”

(Cook et al. 2006:147)
These results support the findings of the original experiment and thus they conclude that “speakers of different languages categorize differently where complex objects are not involved” (Cook et al. 149).

4.4 Panos Athanasopoulos

4.4.1 Introduction

Panos Athanasopoulos is a lecturer at the University of Bangor in Wales whose main research interests are in the areas of Bilingualism and Cognition, Language and Thought, and Language Acquisition. He has carried out some research on the effects of a second language on the cognitive processing of a bilingual speaker. The following focuses on some of the research and experiments he has carried out in this area. His work follows on from that carried out by John Lucy on Yucatec and English speakers. Japanese is a non-plural marking language like Yucatec.

4.4.2 Experiment on monolinguals and second language learners

Athanasopoulos discusses Lucy’s identification of two features of nouns which explain object classification preferences. These are [±animate] and [±discrete] which Lucy shows have an interaction with plural marking. Lucy (quoted in Athanasopoulos 2006:90) also states that they can have three possible “settings” which are:

i.  [+animate] and therefore automatically [+discrete]. Nouns with these “settings” take plural inflection when quantified because “they are discrete by virtue of their animacy”.

ii.  [-animate, +discrete]. Nouns with these “settings” take “obligatory plural inflection when quantified”.

iii.  [-animate, -discrete]. Nouns with these “settings” can’t take plural marking. In order to be counted they need a unitizer or quantifier.
As we previously mentioned, Lucy focuses on the differences in grammatical number marking with nouns in both languages. Both languages have a class of [+animate, +discrete] noun phrase for the purpose of number marking. However, the difference between the two languages is for nouns which represent inanimate objects. English has both [-animate, +discrete] that is, ones which must be pluralized when quantified – e.g. *one pot, two pots* - and [-animate, -discrete] noun phrases which require an unitiser – e.g. *three glasses of water*. This is not the case in Yucatec. In this language, all inanimate objects are of the form [-animate, -discrete] and thus they must take an unitiser (which Lucy also refers to as a classifier). Lucy carried out a picture matching experiment with Gaskins which was similar to the one previously referred to in this thesis (the triad test). There were three sets of pictures, with each set containing six pictures. There was a pivot (principal) picture and then a set of alternates. Each of these alternates had a distinct difference to the original picture; i.e. picture 2 had a different number of animals to the original, 3 and 4 had a different number of implements to the original and the 5 and 6 had different number of substances. The results of this experiment found that the speakers of the languages followed the linguistic patterns of their languages.

He believes that a lot of the current research on the relationship between language and cognition focuses on monolingual speakers, but that this is not the norm as the “majority of the world’s population uses more that one language in order to communicate” (Athanasopoulos 2006:90). He takes the same view as Vivian Cook with regard to bilingualism, considering it to be the norm and monolingualism to be the exception (Cook 1999, 2002 quoted in Athanasopoulos 2006). As a result, he carries out his research on Japanese speakers of English as a second language or L2 by comparing them with Japanese and English monolinguals. He replicates the picture matching task undertaken by Lucy and Gaskins (1992b).

### 4.4.2.1 The Experiment

The following is a description of an experiment undertaken by Panos Athanasopoulos based on a previous experiment by John Lucy and Suzanne Gaskins.
4.4.2.2 Predictions and Expectations

Athanasopoulos expects to see the English monolinguals favour the alternatives which have a different amount of substances to be most like the pivot object (the original picture) i.e. they will consider the number of animals or implements to be important; whereas he expects the Japanese monolinguals to choose the alternatives that have different numbers of animals (Athanasopoulos 2006:91-92). The most interesting results will be to see whether the Japanese who are English L2 speakers will follow the pattern of Japanese, their L1, or if their new language will affect their choices. It is important to know that all L2 participants had to demonstrate their proficiency in their L2 by completing the Oxford Quick Placement Test (QPT), a general proficiency test. They also had to complete a grammaticality judgement task in English.

4.4.2.3 Methodology

There were fourteen English monolinguals, twenty-eight Japanese monolinguals and thirty-eight Japanese L2 English speakers. The Japanese L2 speakers were later separated into an intermediate and advanced group based on their results in QPT test on proficiency. The L2 learners of English in the advanced group had lived in the UK for an average of nine months and the intermediate group for an average of seven months; they had all also started to learn English after the age of twelve. Athanasopoulos points out that all participants had “similar socio-economic and educational backgrounds”. This decreases the possibility of any social or general cultural differences which could be used as an explanation for any difference in results.

The materials used were five sets of six pictures, which contained an original and five alternatives (the same as those used by Lucy in his experiment). The language of instruction was English except for the Japanese monolinguals where an interpreter was present to translate into Japanese.
4.3.2.4 Results

Firstly, all responses were scored out of five as to the number of times that they chose a particular alternative; this was because each participant had five opportunities to select an alternative. These scores were then converted to percentages and the average was calculated for each group of participants. Athanasopoulos then carried out numerous statistical tests on the results obtained from participants in the experiment. The following table demonstrates the responses provided by participants in the picture-matching experiment.

<table>
<thead>
<tr>
<th>Groups</th>
<th>Alternate 2 Animals</th>
<th>Alternates 3 &amp; 4 Implements</th>
<th>Alternates 5 &amp; 6 Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>English monolinguals</td>
<td>3 (7)</td>
<td>33 (17)</td>
<td>64 (18)</td>
</tr>
<tr>
<td>Japanese L2 English advanced</td>
<td>4 (8)</td>
<td>36 (19)</td>
<td>60 (21)</td>
</tr>
<tr>
<td>Japanese L2 English intermediate</td>
<td>8 (12)</td>
<td>40 (21)</td>
<td>52 (25)</td>
</tr>
<tr>
<td>Japanese monolinguals</td>
<td>5 (13)</td>
<td>54 (17)</td>
<td>41 (20)</td>
</tr>
</tbody>
</table>

Table 1. Participants’ mean percentage proportion of responses (and standard derivation) in the picture-matching task. Figures are rounded to the nearest number. (Athanasopoulos 2006:93)

Athanasopoulos concludes that the results from the experiment support the predictions made. He found that the English monolinguals and the L2 advanced speakers of Japanese made a “significant distinction between Implements and Substances, tending to select the latter most of the time” (Athanasopoulos 2006:93). In contrast, the Japanese monolinguals and the L2 intermediate speakers of English made little or no distinction
between the two and treated them in a similar way (Athanasopoulos 2006:93). Thus we can see that the L2 advanced learners of English act more like English monolinguals and the L2 intermediate learners act more like Japanese monolinguals. From this, he concludes that L2 acquisition may alter cognitive dispositions which have were previously influenced by the L1.

“Overall then the results show that the cognition of the two L2 groups correlates with their proficiency in the L2 and with their performance on the grammaticality judgement task. The more successful the L2 learners are in the QPT and in the grammaticality judgement of number marking and articles in English, the more they behave like monolingual speakers of English in the cognitive task.”

(Athanasopoulos 2006:94)

4.4.3 Experiment on monolinguals and bilinguals

The following is a description of an experiment undertaken by Panos Athanasopoulos.

4.3.3.1 Methodology

Athanasopoulos replicated Lucy’s triad matching task with three groups: twenty five English monolinguals, twenty five Japanese monolinguals and a group of twenty six Japanese-English bilinguals. The bilinguals were split into two groups, one of which was instructed in English and the other in Japanese. As before, proficiency amongst the bilinguals was tested with a QPT proficiency test and a grammaticality judgement task. The bilinguals had been living in the UK for an average of nine months, and the majority had started to learn English at age twelve. Eighteen of the bilinguals were instructed in their L1 (Japanese) by a native L1 speaker.
There were two experimental conditions, one was where the objects were count nouns in English i.e. solid entities that can be counted; the other was with non-solid or mass entities which are mass nouns in English.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Shape alternate</th>
<th>Material alternate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic clip</td>
<td>Metal clip</td>
<td>Plastic pieces</td>
</tr>
<tr>
<td>Wooden spoon</td>
<td>Plastic spoon</td>
<td>Stick of wood</td>
</tr>
<tr>
<td>Candle</td>
<td>Candle-shaped wood</td>
<td>Piece of wax</td>
</tr>
<tr>
<td>Cork pyramid</td>
<td>Plastic pyramid</td>
<td>Chunk of cork</td>
</tr>
<tr>
<td>Plastic UFO</td>
<td>Wooden UFO</td>
<td>Piece of plastic</td>
</tr>
<tr>
<td>Wax kidney</td>
<td>Plaster kidney</td>
<td>Wax pieces</td>
</tr>
</tbody>
</table>

Table 2.1 List of materials for count condition arranged in triads (from Athanasopoulos 2007:694).

The diagram below shows a sample triad.

![Diagram](image)

Figure 6. An example of the triads used in the experiment
(Cook et al. 2006:141)
Table 2.2 List of materials for mass condition arranged in triads (from Athanasopoulos 2007:694). Letters in brackets represent the shapes the objects were arranged into.

<table>
<thead>
<tr>
<th>Standard</th>
<th>Shape alternate</th>
<th>Material alternate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toothpaste arch</td>
<td>Plasticine arch</td>
<td>Pile of toothpaste</td>
</tr>
<tr>
<td>Stick of chalk</td>
<td>Stick of wax</td>
<td>Pile of chalk</td>
</tr>
<tr>
<td>Pepper upside down (V)</td>
<td>Toothpaste upside down (V)</td>
<td>Pile of pepper</td>
</tr>
<tr>
<td>Sawdust upside down (w)</td>
<td>Leather upside down (w)</td>
<td>Two piles of sawdust</td>
</tr>
<tr>
<td>Decoration sand reverse (S)</td>
<td>Glass reverse (S)</td>
<td>Three piles of sand</td>
</tr>
<tr>
<td>Nivea cream reverse (C)</td>
<td>Plasticine reverse (C)</td>
<td>Nivea cream pile</td>
</tr>
</tbody>
</table>

The participants were shown the objects which were presented on white plates and covered with a piece of paper until they were revealed. The English monolinguals and first group of Japanese-English bilinguals were instructed to ‘Show me which is the same as this’. The Japanese monolinguals and other group of bilinguals were instructed to ‘Kore (this) to (with) onaji-nano (same) wa (topic-marker) docchi (which) desuka (is)’ (cf. Imai & Mazuka 2003, quoted in Athanasopoulos 2007:695). The order in which the objects were presented was randomised for each participant.

4.3.3.2 Results

With the monolingual participants the results supported previous studies which had been undertaken by Lucy and Cook et al’s experiment. The differences in cognition displayed goes hand in hand with the grammatical differences and similarities found in both languages with regard to how they mark number on noun phrases (see experiments undertaken by Lucy, Cook et al. and previous experiment by Athanasopoulos). Athanasopoulos states that both groups show preference for shape over material when the object is countable rather than non-countable.

“This finding supports Imai’s (2000) and Imai and Mazuka’s (2003) claim that the ontological distinction between objects
and substances is universal, and that language may modulate the degree to which that distinction is observed cognitively”
(Athanasopoulos 2007:697)

The bilingual participants displayed choices which fell between those of the two monolingual groups. Athanasopoulos states that “the best predictor of that cognitive shift was L2 proficiency” (Athanasopoulos 2007:697). He also mentions that there were no significant differences between the bilinguals who were instructed in their L1 and those who were instructed in their L2.

4.4 Lera Boroditsky

Lera Boroditsky is a professor in psychology at Stanford University. Her main research is in the area of Cognitive Science, particularly language and cognition and the interactions between language, cognition and perception. She has written many papers relating to this and the area of linguistic relativity.

In her various papers relating to linguistic relativity Boroditsky refers to the “obvious” differences amongst languages: vocabulary, pronunciation and indeed grammar (Boroditsky 2003a). She describes how if a single sentence was repeated in different languages, that each language would have its own particular way of representing the sentence i.e. it would focus on different aspects of it. If we look at the sentence The elephant ate the peanuts we can see some of these differences that she discusses. In English we must use tense, i.e. refer to when the event took place, whereas in Mandarin and Indonesian using tense would be optional and it would be implied separately to the verb. Russian, like English, would require tense but if it occurred in the past tense, it would also require some extra information: whether or not the person eating the peanuts was male or female. Russian would also need to know whether all or some of the peanuts were eaten, this is also found in French. Finally, Turkish would need to know whether or not the event of the peanuts being eaten had actually happened or whether it was just “hearsay”; this would be shown as a suffix on the verb (example taken from Boroditsky 2003a:917). She states that these differences may have some influence on cognition i.e.
relate to the weaker version of the Sapir-Whorf hypothesis – linguistic relativity; but she dismisses the notion of linguistic determinism as having “long been abandoned in the field” (Boroditsky 2003a:917). As a result, she reflects on linguistic relativity amongst languages in different areas.

4.4.1 Space

Boroditsky states that languages vary considerably in how spatial relations are described. For example English and Dutch both distinguish between putting things into containers and onto surfaces (Boroditsky 2003a:918). For example in English, we would say *She put the key in the lock* and *She put the key on the table*. Korean, however, distinguishes between “tight and loose fit or attachment” (Boroditsky 2003a:918). So if we take the example above *She put the key in the lock* and compare it to *She put the trousers in the basket*; in Korean we would need to use the term *nehta* to refer to the loose containment proposed by putting the trousers in the basket and the term *kitta* to refer to the tight fit of putting a key in the lock (examples are my own, based on similar ones provided by Boroditsky). This difference in spatial relations was tested by McDonough et al. to see if there were any implications for linguistic relativity. They discovered that prelinguistic infants may react to any number of spatial distinctions; whereas people who use language have their spatial distinctions determined for them by their own language (referenced in Boroditsky 2003a).

Distinctions amongst languages have also been noted in relation to spatial locations (Levinson 1996 quoted in Boroditsky 2003a:918). Languages such as English and Dutch use terms such as *left/right, front/back* to refer to spatial locations, Tzeltal (a Mayan language) focuses on absolute reference, which Boroditsky states is similar to using *north, south* etc in English; north referring to downhill and south referring to uphill. There is no equivalent in Tzeltal for the English terms. A test was carried out by Levinson to see if there was any relationship between these differences and cognition. He found that:

“*Tzeltal speakers’ heavy reliance on absolute reference in*
spatial description appears to have affected their interpretation of (and performance on) a non-linguistic orientation task”

(Boroditsky 2003a:918)

Boroditsky concludes from these tests and observances, that there is a suggestion that language may indeed constrain a speaker’s spatial thinking.

4.4.2 Time

There are also differences in languages in their representation of time. Spatial terms such as forward, behind, ahead are used in all languages to refer to time but different languages use different spatial terms (Boroditsky 2003a:919). In English we use horizontal terms to talk about language such as front/back; Mandarin uses horizontal terms too, but it also has a vertical representation of time using terms such as up/down. Boroditsky carried out an experiment based on the different time representations in English and Mandarin on native speakers of each language. It was found that English speakers:

“answered purely temporal questions faster after horizontal primes than vertical primes…. When answering questions phrased in purely temporal early/later terms, Mandarin speakers were faster after vertical primes than after horizontal primes”

(Boroditsky 2001:10)

These results reflect the way each of the languages treats time, thus it points towards linguistic relativity. Below are some sample primes presented to participants.
4.4.3. Shapes and Substances

Boroditsky also discusses the differences which are found in the grammatical distinction between objects and substances. She discusses the experiment undertaken by Lucy and Gaskins (previously described in this paper) and the results it provided. She states that their findings point to the ability of these aspects of grammar to shape a speakers conceptualisation of the shapes and materials of objects (Boroditsky 2003a:919-920).
4.4.4. Objects

The area of how objects are named is also considered. Many languages have a grammatical gender system where all nouns in that language are assigned a certain gender. These are more commonly masculine and feminine but neuter, vegetative and other genders can be found in languages throughout the world. Grammatical gender is denoted in these languages through the definite articles and pronouns used with them. A study carried out by Boroditsky, Schmidt and Philips found that when participants of two languages were asked to describe objects of opposite gender in each language using adjectives, their choices reflected the gender of the object (Boroditsky 2003a:920). This experiment is described in detail later in this thesis, and it is replicated in one of my own experiments.

4.4.5 Conclusions

From all of these experiments and considerations, Boroditsky comes to the conclusion that “languages appear to influence many aspects of human cognition” (Boroditsky 2003a:920). She supports the weak version of the linguistic relativity hypothesis.

4.4.6 Further experiments undertaken by Boroditsky.

Boroditsky undertook several studies amongst people of different languages, testing their cognitive differences as a result of language.

She carried out an experiment with several colleagues, on Russian and English speakers to see if their different ways of representing the word blue would lead to differences in colour discrimination. There is a distinction in Russian between blues which are dark and those which are lighter. Lighter blues are referred to as goluboy and the darker ones as siniy (Boroditsky 2007:1). She states that unlike English, there is no single word in Russian which can be used to refer to all of the colours of blue.
4.4.6.1 Experiment 1

English speakers and Russian speakers were tested in an objective discrimination colour task. They were presented with three blue colours from a twenty colour collection (presented below) which spanned the Russian goluboy/siniy range. Participants were asked to pick out of two possible squares, whichever blue they believed was identical to the top square. An example of this test can be seen below. In the Russian trials, there were both “within-category” trials and “cross-category” trials; i.e. participants were tested when the match and the distracter item was belonging to the same category and when it wasn’t (Boroditsky 2007:2).

They expected the Russian speakers to be quicker to make faster cross-category discriminations than within-category ones. English speakers shouldn’t react any differently. They should disregard the categories that are available in Russian.

![Figure 9](image_url)
4.4.6.2 Results

It was found that the Russian speakers were quicker at discriminations if the colours fell into different Russian blue categories, than if they were from the same category. English speakers did not reflect any sort of category advantage. Thus they conclude that:

“These results demonstrate that categories in language can affect performance of basic perceptual color discrimination. Further, they show that the effect of language is online, because it is disrupted by verbal interference. Finally, they show that color discrimination performance differs across language groups as a function of what perceptual distinctions are habitually made in a particular language”

(Boroditsky et al. 2007:4)

4.4.7 Experiment 2

In a study carried out on Russian speakers by Jakobson (1966 referenced in Boroditsky 2003b), it was found that when asked to classify the days of the week as either male or female, the days were constantly personified relating to their gender i.e. if the day were masculine it was made male and if it were feminine it was female. The problem with this test is that it was carried out in the speaker’s native language and hence it only shows the effect in their native language and not on their thinking as a whole.

This led to a series of tests carried out by Boroditsky, Schmidt and Phillips (2003b) using English as the test language. One such experiment was where they taught a group of Spanish and German speakers’ proper names for objects such as Patrick for an apple and then they tested the recall capabilities of each person. Each object had a different gender in Spanish and German, and was undertaken completely in English. The aim was to see that if the proper name given to an object had the same gender as the object in the subject’s native language then it should be easier for them to recall then if it
had an opposite proper name to its gender. They found that where the object name and proper name given were the same neither group had an issue recalling the proper name whereas when they were inconsistent with regard to their gender, there were problems with recall for both Spanish and German participants. The experiment was also carried out on a group of English speakers who remembered more consistent and inconsistent pairs than either of the Spanish and German groups.

“This suggests that Spanish and German speakers’ previous language experience actually interfered with their ability to remember object-name pairs when the pairs happened to be conceptually inconsistent in gender… Objects do appear to have conceptual gender, and this gender is consistent with the grammatical gender assigned by language.”

(Boroditsky, Schmidt & Phillips 2003b: 68-9)

4.5 Benedetta Bassetti

Benedetta Bassetti is a lecturer at Birkbeck, University of London. Her main research areas are bilingualism, second language acquisition, psycholinguistics and writing systems. She has carried out some research in the area of Linguistic Relativity, including research with Vivian Cook et al. (previously outlined in this paper). The following is a discussion of a set of experiments undertaken by Bassetti in relation to bilingualism and thought. Her research focuses on grammatical gender and concepts of objects in Italian-German bilingual children and Italian monolingual children. This paper follows on from one of the experiments described later by Boroditsky, Schmidt and Philips, which also leads to my own replication of a grammatical gender experiment.

Bassetti states that languages with grammatical gender lead to monolingual speakers of these languages, interpreting objects based on their grammatical gender.

“Monolingual German and Italian speakers consider these entities more masculine or feminine depending on the grammatical gender of the entity’s noun.”

(Bassetti 2007:252)
She then continues by saying that some languages have opposite gender and this may “affect bilingual speakers’ representations” (Bassetti 2007:252). In order to investigate this, bilingual children who were native speakers of a language which was also the native language of a group of monolingual counterparts, were tested to see if they reacted differently due to their exposure to more than one language.

4.5.1 Fundamentals

Italian is a language with masculine and feminine gender whereas German has masculine, feminine and neuter genders. Grammatical gender relates to both animate and inanimate objects, it is not necessarily associated with whether or not the object is male, female or linked with a particular sex. In fact the gender of most objects appears to be quite random. For example in Irish the word for a young girl *cailín* is masculine and in French the word for a handbag *sac à main* is masculine.

Bassetti also states that the reflection of grammatical gender can be seen in the personification of inanimate objects as being either male or female based on their gender in that language.

> “the sun [is personified] as a man and the moon as a woman in Italian visual arts and … the sun as a woman and the moon as a man in German visual arts”.

(Bassetti 2007:255)

She elaborates on this by pointing out that an advertisement campaign that was run throughout the world had a football which spoke to the audience. The voice used for the football seemed to depend on the grammatical gender of the word “football” in each language so in the Brazilian Portuguese ad the football spoke with a feminine voice; as a football in Portuguese is feminine. In Germany, however, the football spoke with a masculine voice, reflecting the fact that football is a masculine word in German. She supports this by pointing out that is has been proven that “grammatical gender affects consumers’ behaviour”, with Spanish speakers more inclined to choose something with a
feminine brand name for a woman and a masculine brand name for a man” (Bassetti 2007:255). An example of this is people who “prefer the fictitious brand name Aizo rather than Aiza for a beer (which is considered a man’s drink) and then the opposite for a margarita (a woman’s drink; Yorkston & de Mello, 2005)” (Bassetti 2007:255).

4.5.2 Predictions and Expectations

The following is a summary of an experiment carried out by Benedetta Bassetti testing reactions by Italian monolinguals and Italian-German bilinguals in choosing male or female voice for objects.

It was predicted that a male voice would be chosen for the masculine objects and a female voice for the feminine objects by the monolingual Italian speakers. The Italian-German bilinguals would not be affected by the gender of these objects in Italian when choosing a voice for these objects.

4.5.3 Methodology

There were 21 monolingual children and 21 bilinguals. Both groups were asked to choose either a male or a female voice to put with a selection of pictures of objects. All of these objects had opposing gender in Italian and German. The bilinguals were subjected to a questionnaire which revealed that they could all be considered as balanced bilinguals. There were 12 pictures which were black and white line drawings of familiar concrete objects. These objects were all artefacts because of previous research which had shown a trend in choosing natural objects as feminine and artificial objects as masculine (Bassetti 2007:261). The images were also black and white to avoid any possible gender choice based on colour. The children heard two sentences such as Ti pace il succo d’arancia? (Do you like orange juice?) to go with a straw, one in a male voice and the other in a female voice and were asked to select which one was suitable to the object they were presented with. The order of objects presented and the voices which came with it was randomized.
4.5.4 Results

The children were all asked to state whether they found the task difficult, none of them found it difficult, thus they understood what had to be done. An ANOVA statistical test was undertaken to ensure that the gender of the children didn’t affect the choices they made; it was found that gender had no impact on choice. The results for voice choices showed that the monolingual group favoured female voice choices for the Italian grammatically feminine objects. The bilingual group did not seem to react to grammatical gender in the same way as the monolinguals, these results are supported by ANOVA statistical test results. These results were confirmed by *t* tests against chance levels. Each participant was also marked by their preference for either German gender preference or Italian preference based on their choices. If they gave 7 or more choices favouring one language then that was the preference they were assigned to. If there was equal choice between the two, then they were assigned no preference. The following table depicts the results found.

<table>
<thead>
<tr>
<th>Group</th>
<th>Italian preference</th>
<th>German preference</th>
<th>No preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monolinguals</td>
<td>71% (15)</td>
<td>19% (4)</td>
<td>10% (2)</td>
</tr>
<tr>
<td>Bilinguals</td>
<td>52% (11)</td>
<td>33% (7)</td>
<td>14% (3)</td>
</tr>
</tbody>
</table>

Table 3. Percentage of participants classified as Italian preference, German preference or no preference by group (number in brackets) (Bassetti 2007:264)

There is some preference by the bilingual speakers towards a female voice for the feminine objects, but this is not statistically significant. Nevertheless, we can see that the monolingual children showed a preference for voices that reflected the grammatical gender of the object in Italian. The bilingual children were not affected in the same way. This may point to some sort of change in concepts based on speaking two languages which have opposing grammatical gender for the same objects. Bassetti states that “the difference between bilinguals and monolinguals in this experiment can only be attributed to language” (Bassetti: 2007:268). She continues by stating that these results may have
implications for the acquisition of second language grammatical gender and that in monolinguals it appears to be conceptual and not simply a grammatical feature of their language (Bassetti 2007:269).
Chapter 5

Experiments
5.1 Research Strategies

According to John Lucy there are two different types of strategy for empirical investigation, domain-centred and structure-centred. Domain-centred approaches focus on a particular domain of experience i.e. something like space or time or colour. They then try to describe this domain in “language-independent grounds” (Lucy 2004:5) which tries to investigate how different languages treat these domains, and to see how the area is regarded in relation to cognition. Lucy continues by describing the disadvantages with this format of investigation. He says that choosing a particular representation of a reality isn’t suitable because not all representations are universal; this is because they are often drawn from one linguistic and cultural tradition. He elaborates on this idea by saying that if we stick to one representation of reality as “the standard for comparison”, then we could be supporting the language and culture from where that representation arose (Lucy 2004:5).

Another strategy which he discusses is structure-centred empirical investigation. This strategy selects a particular grammatical structure e.g. number or gender or aspect marking; it then asks how that particular structure differs across languages and if there is any how will they appear to the speakers of these different languages. Lucy states that this method uses multiple languages from the beginning and thus doesn’t encounter the same type of problems as in domain-centred research. However, he states that it is not without its flaws. This type of research can be difficult to implement, as it requires a lot more effort to carry out (Lucy 2004:5).

5.2 Introduction to Experiments

Apart from all of the experiments and empirical research that I have previously mentioned throughout this thesis, I have also implemented two experiments of my own; one focusing on grammatical gender and the other on the syntactic structure of languages. These would be structure-centred tests of the Linguistic Relativity Proposal.
5.3 Experiment 1: Grammatical Gender

5.3.1. Background

The first experiment undertaken was a continuation of one that had been carried out before. It is based on research from a paper by Boroditsky, Schmidt and Philips. Throughout the description of the experiment, both object and noun will be used interchangeably.

5.3.2 Original Experiment

In the original paper, Boroditsky et al. (2003b) used grammatical gender as a basis for testing the notion that language effects cognition. They wanted to see if speakers of different languages would focus on different aspects of the same object (Boroditsky, Schmidt and Philips 2003b:69). They created a list of 24 object names, which had varying gender in Spanish and German, i.e. if the object was feminine in Spanish then it was masculine in German and vice versa. They then presented it to native Spanish and native German speakers. They were then asked to describe the object with the first three adjectives that came to mind. These adjectives were to be given in English, as the whole experiment was carried out in English; both groups were highly competent in English despite being native speakers of other languages, as it has no grammatical gender. The idea was that the adjectives presented by the participants would reflect the gender of the object in their language. They found that where an object was feminine in Spanish such as ‘key’, the adjectives used were tiny and intricate whereby the adjectives used for the same masculine noun in German were hard and jagged. These results suggest some support for the view that grammatical gender affects the way a person views an object. However, it is important to note that Boroditsky, Schmidt and Philips considered this experiment as conservative because it was being carried out through English.
5.3.3 Prior Replicated Experiment on French native speakers

Previous to the experiment replicated in this study, I had attempted to carry out this experiment before, following the original by Boroditsky et al. The experiment was carried out on a group of French native speakers to see if their reactions to objects with varying grammatical gender would reflect the results obtained in the original experiment. A list of twenty images was created which had either masculine or feminine gender in French, ten of each. These objects were both animate and inanimate. As in the original experiment, it was carried out in English; participants were required to describe each object using three English adjectives, without knowing the purpose of the study. A list with the names of these objects in English was also made and presented to a group of English speakers who were asked to determine whether they considered the objects to be male or female.

It was expected that the French speakers would react similarly to the German and Spanish participants in the original experiment and that the English speakers would give arbitrary answers for their choice of male or female, regardless of gender.

After gathering all the adjectives, it was necessary to carry out statistical analysis to see if the results were statistically viable. This was carried out by genderising each of the nouns (objects) based on the criteria outlined above. Each adjective that was considered to be masculine was given a mark of +1 and any that were considered to be feminine were given a mark of -1. These scores were added up for each object and then used in the statistical analysis. The statistical test used was the Wilcoxon test and the results found that the probability of a random result was 5 in 100; thus it was concluded that grammatical gender affected the way the participants described the objects, i.e. their choices were based on gender.

5.3.4 Current Replicated Experiment testing English and French speakers

This test was again replicated for this paper, but this time English speakers were asked to carry out the same experiment as the French speakers (unlike the previous replication). This experiment also had Spanish and Italian speakers who participated.
5.3.4.1 Fundamentals

Participants were again presented with twenty images of objects which were either masculine or feminine in French. The list contained objects which were all chosen because of their gender but they were also balanced with regard to animacy; i.e. there were both animate and inanimate objects. When choosing pictures to represent the objects that were to be described, I tried to ensure that all images were of equal interest and that the object seen in each was as generic as possible. The reason behind this was to ensure that participants would focus on the object and not on the object within the context of the picture. In the previous experiment an image of a bridge had been presented, and some of the results received had a lot of adjectives describing the bridge as it appeared in the picture i.e. ‘over water’ or which described the image itself i.e. ‘rainy’; thus there was an attempt to avoid this type of issue in the second replication of this experiment. All images were taken from results from the Google search engine (see Appendix A).

5.3.4.2 The Experiment

1. Aims

To test the results from the experiment undertaken by Boroditsky, Schmidt and Philips, and those obtained in my own previous replicated experiment. It was important to see if these results would hold if English speakers were tested under the same conditions.

2. Expectations

I expected the results of the experiment to support those obtained in the original experiment.
3. Methodology

The experiment was carried out on an online experimenter system hosted by the Computer Science department in Trinity. Each participant was presented with twenty images, they were asked to first name the object in the image, and then to describe it using three English adjectives. They were asked to name the object to ensure that they were describing the correct object and also in case they perceived an alternative synonym than the one that had been considered; i.e. some people chose the word mug instead of cup for one of the images. In this case the gender of ‘mug’ could be checked to see if it was the same as ‘cup’ and if it wasn’t, would the adjectives represent the gender of the object they had named it to be?

At the end of the experiment, participants were asked a set of demographic and control questions; gender, age bracket, handedness, languages spoken in order of decreasing fluency, what language they counted in and what they thought the experiment was about.

4. Results

An initial look at the results of the experiment would suggest that there may be some evidence in favour of the Sapir Whorf Hypothesis. Some of the most common adjectives used to describe the masculine objects were typically masculine: *useful, big, long, strong, hard, metal*; whereas some of the adjectives used to describe the feminine objects were: *shiny, silvery, light, pretty, glistening, elegant*. These early results are similar to those found by Boroditsky, Schmidt and Phillips found in their object description test.

5. Genderising adjectives

The first step was to genderise adjectives as outlined by Boroditsky et al. A group of English speaking participants were asked to choose which gender they thought was
best suited to each object i.e. were they masculine or feminine. These participants did not
know the purpose of the experiment. The results obtained were then added up to ascertain
a score for each adjective. However, there was a problem with this as many of the
adjectives received from the participants in the gender experiment were given by more
than one participant, i.e. different participants provided the same adjective to describe the
object concerned. The problem that arose from this was whether to count each occurrence
of these adjectives or just one, as this was not explicitly explained in the original
experiment. The decision was made to count each occurrence of these adjectives. There
were some answers given which were not adjectives, thus they were given a mark of 0. I
also came across an interesting neologism ‘cudorable’ which is made up of cute and
adorable. However, this was not included, as it is not a regularly occurring or indeed
“proper” word thus it cannot be classed as an adjective (it was searched for in Google and
only 2 results came back, both from blog entries).

One participant had misinterpreted the experiment, and thus instead of simply
naming the object in the image, they gave responses such as “human nature” for a bicycle
and thus these responses had to be discounted as they were not following the guidelines
for the experiment. The following table shows some of the initial results obtained from
the experiment.
<table>
<thead>
<tr>
<th>#</th>
<th>Object</th>
<th>Expected Gender</th>
<th>Total score</th>
<th>Gender with total</th>
<th>Match?</th>
<th>English L1 scores</th>
<th>New score</th>
<th>Gender with English scores removed</th>
<th>Match?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apple F</td>
<td></td>
<td>+5</td>
<td>M</td>
<td>No</td>
<td>+2</td>
<td>+3</td>
<td>M</td>
<td>No</td>
</tr>
<tr>
<td>2</td>
<td>Bee F</td>
<td></td>
<td>+7</td>
<td>M</td>
<td>No</td>
<td>+1</td>
<td>+6</td>
<td>M</td>
<td>No</td>
</tr>
<tr>
<td>3</td>
<td>Bike M</td>
<td></td>
<td>+26</td>
<td>M</td>
<td>Yes</td>
<td>+4</td>
<td>+22</td>
<td>M</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Bridge M</td>
<td></td>
<td>+39</td>
<td>M</td>
<td>Yes</td>
<td>+15</td>
<td>+24</td>
<td>M</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Car F</td>
<td></td>
<td>+11</td>
<td>M</td>
<td>No</td>
<td>+3</td>
<td>+8</td>
<td>M</td>
<td>No</td>
</tr>
<tr>
<td>6</td>
<td>Chair F</td>
<td></td>
<td>+29</td>
<td>M</td>
<td>No</td>
<td>+14</td>
<td>+15</td>
<td>M</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Clock F</td>
<td></td>
<td>+3</td>
<td>M</td>
<td>No</td>
<td>+4</td>
<td>-1</td>
<td>F</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>Dog M</td>
<td></td>
<td>-33</td>
<td>F</td>
<td>No</td>
<td>-14</td>
<td>-19</td>
<td>F</td>
<td>No</td>
</tr>
<tr>
<td>9</td>
<td>Football M</td>
<td></td>
<td>-2</td>
<td>F</td>
<td>No</td>
<td>+1</td>
<td>-3</td>
<td>F</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Fork F</td>
<td></td>
<td>+5</td>
<td>M</td>
<td>No</td>
<td>-1</td>
<td>+6</td>
<td>M</td>
<td>No</td>
</tr>
<tr>
<td>11</td>
<td>Glass M</td>
<td></td>
<td>+5</td>
<td>M</td>
<td>Yes</td>
<td>+5</td>
<td>0</td>
<td>NONE</td>
<td>No</td>
</tr>
<tr>
<td>12</td>
<td>Kettle F</td>
<td></td>
<td>+9</td>
<td>M</td>
<td>No</td>
<td>0</td>
<td>+9</td>
<td>M</td>
<td>No</td>
</tr>
<tr>
<td>13</td>
<td>Cup F</td>
<td></td>
<td>-23</td>
<td>F</td>
<td>Yes</td>
<td>-12</td>
<td>-11</td>
<td>F</td>
<td>Yes</td>
</tr>
<tr>
<td>14</td>
<td>Pen M</td>
<td></td>
<td>+8</td>
<td>M</td>
<td>Yes</td>
<td>+1</td>
<td>+7</td>
<td>M</td>
<td>Yes</td>
</tr>
<tr>
<td>15</td>
<td>Phone M</td>
<td></td>
<td>+23</td>
<td>M</td>
<td>Yes</td>
<td>+13</td>
<td>+10</td>
<td>M</td>
<td>Yes</td>
</tr>
<tr>
<td>16</td>
<td>Spoon F</td>
<td></td>
<td>-14</td>
<td>F</td>
<td>Yes</td>
<td>-3</td>
<td>-11</td>
<td>F</td>
<td>Yes</td>
</tr>
<tr>
<td>17</td>
<td>Tree M</td>
<td></td>
<td>-6</td>
<td>F</td>
<td>No</td>
<td>0</td>
<td>-6</td>
<td>F</td>
<td>No</td>
</tr>
<tr>
<td>18</td>
<td>Umbrella M</td>
<td></td>
<td>+27</td>
<td>M</td>
<td>Yes</td>
<td>+9</td>
<td>+16</td>
<td>M</td>
<td>Yes</td>
</tr>
<tr>
<td>19</td>
<td>Book M</td>
<td></td>
<td>+2</td>
<td>M</td>
<td>Yes</td>
<td>-2</td>
<td>+4</td>
<td>M</td>
<td>Yes</td>
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<tr>
<td>20</td>
<td>Bin F</td>
<td></td>
<td>+30</td>
<td>M</td>
<td>No</td>
<td>+12</td>
<td>+18</td>
<td>M</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 4. Initial results of grammatical gender test

6. Statistical Analysis

The main problem with the results from these experiments is that they do not provide definitive proof that the hypothesis holds, thus a statistical analysis must be undertaken either to prove or disprove the expectations. The test that was used was the non-parametric Mann-Whitney test. This was chosen by using the helpful flowcharts on the sleeve of the “Learning to use statistical tests in psychology” book. This test is designed to test responses for an unrelated design with different subjects who are used in two conditions.
6.1 Experimental hypothesis

When a group of native French, Spanish and Italian speakers are asked to use three English adjectives to describe an object with a particular gender in French, the adjectives used will reflect the gender of the object because grammatical gender in a language affects the way we think. When a similar group of English speakers are asked to carry out the same task, there will be no reflection of gender in the adjectives chosen. This hypothesis is a one-tailed hypothesis as it makes a prediction in one direction only.

6.2 Null hypothesis

When a group of French, Spanish and Italian speakers and a group of English speakers are asked to use three English adjectives to describe an object, the adjectives used will reflect the gender of the object due to random fluctuations in people’s performance.

6.3 The independent variable

The independent variable is whether people are given an object with masculine or feminine gender.

6.4 The dependent variable

When describing the objects, will people use adjectives which are related to the grammatical gender of the object?

6.5 Experimental condition 1

The objects were presented to a group of English L1 speakers.
6.6 Experimental condition 2

The objects were presented to a group of French, Spanish and Italian L1 speakers.

6.7 Rationale

The aim of this test is to find out if there are significant differences in the participants’ results under the two conditions. It is not possible to compare scores for each subject as they only produce a score under one condition (Greene & D’Oliviera 1999:51). Remembering that each of the objects was marked as either +1 for a masculine adjective and -1 for a feminine adjective, we are expecting to see high, positive scores for the masculine objects and low or negative scores for the feminine ones.

6.8 Mann-Whitney Test

All results were ranked, using each group as separate overall ranks. The rank scores for each were then totalled and used in the following calculation to calculate the value of U, which will be used to test the statistical viability of the experiment.

\[
U = n_1n_2 + \left( n_1(n_1+1)/2 \right) - T_1 \\
(6 \times 9) + (6(6+1))/2 - 205 = 130
\]

Where:

\( N_1 \) = number of participants in condition 1
\( N_2 \) = number of participants in condition 2
\( T_1 \) = rank total for condition 1

\[ U^1 = n_1n_2 - U \]
\[ (6 \times 9) - 130 = 76 \]
\[ U = 76 \]
<table>
<thead>
<tr>
<th>Objects</th>
<th>Experimental Condition 1</th>
<th>Overall ranks (ranks 1)</th>
<th>Experimental Condition 2</th>
<th>Overall ranks (ranks 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>English L1 speakers</em> 6</td>
<td></td>
<td><em>Non English L1 speakers</em> 9</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>+2</td>
<td>7.5</td>
<td>+4</td>
<td>6.5</td>
</tr>
<tr>
<td>2</td>
<td>+1</td>
<td>4.5</td>
<td>+5</td>
<td>8.5</td>
</tr>
<tr>
<td>3</td>
<td>+4</td>
<td>11.5</td>
<td>+19</td>
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</tr>
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<td>+15</td>
<td>19</td>
<td>+21</td>
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</tr>
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<td>+3</td>
<td>9.5</td>
<td>+8</td>
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</tr>
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<td>-3</td>
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</tr>
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</tr>
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<td>14.5</td>
<td>-10</td>
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</tr>
<tr>
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<td>4.5</td>
<td>+4</td>
<td>6.5</td>
</tr>
<tr>
<td>15</td>
<td>+13</td>
<td>16</td>
<td>+7</td>
<td>10</td>
</tr>
<tr>
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<td>-3</td>
<td>9.5</td>
<td>-12</td>
<td>14.5</td>
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<td>0</td>
<td>1.5</td>
<td>-5</td>
<td>8.5</td>
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<td>14.5</td>
<td>+15</td>
<td>16</td>
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<td>19</td>
<td>-2</td>
<td>7.5</td>
<td>+2</td>
<td>2.5</td>
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<td>15</td>
<td>+16</td>
<td>17.5</td>
</tr>
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<td></td>
<td>$T_1 = 205$</td>
<td></td>
<td>$T_2 = 210$</td>
</tr>
<tr>
<td>Mean</td>
<td>10.25</td>
<td>Mean</td>
<td>10.5</td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Grammatical gender scores for English L1 and non-English L1 speakers
7. Results

The score of U (76), which was calculated above, was then looked up in the tables provided in the back of the book based on the number of participants. It was found that for a one tailed hypothesis with this number of participants the value for U had to be 12 or less to hold. Thus the results of this test are not statistically viable.

8. Discussion

The non English L1 speaking participants were a mixture of French, Spanish and Italian speakers. However, the nouns that participants were asked to describe all had the same gender in all three languages, so this could not be listed as a factor pointing towards the failure of the test to hold statistically. Many of the adjectives given by the speakers of languages with grammatical gender were also used by the English speakers. Both groups only had descriptions with the same gender as the object for nine out of the twenty. This points to an arbitrary choice of adjectives which do not reflect the gender of the object.

5.4 Experiment 2: SVO-VSO

5.4.1 Background

This experiment is based on the syntactic structure differences between English and Irish. The Irish language is a VSO (Verb – Subject – Object) language i.e. the verb comes first in a sentence, followed by the subject that it refers to e.g. ‘Tá an cailín ag damhsa’ which in English would be produced as ‘The girl is dancing’ as English is an SVO (Subject – Verb – Object) language. In order to test if these differences in syntax would display differences in cognition of their speakers, an experiment was undertaken on Irish and non-Irish speakers.
5.4.2 Fundamentals

Participants were presented with thirteen images which depicted a subject carrying out a particular action. The images were all tested to ensure that both the subject and action would be of equal interest to the participant. They were also tested to ensure that each image containing a subject and an image such as ‘cats fighting’ and ‘fish swimming’ were of similar occurrence levels, i.e. they both had similar frequency. This was tested by using Google Fight to test the frequency of these pairs online (www.googlefight.com). All images were taken from the Google search engine (as before).

5.4.3 The Experiment

1. Aims

1. To see if Irish speakers will choose the action over the subject reflecting the syntactic structure of Irish.
2. To see if non-Irish speakers will choose the subject over the action.

2. Expectations

Irish speakers should tend towards action choices based on the structure of their language and non-Irish speakers should tend towards subject choices.

3. Methodology

The experiment was set up on the Experimenter System of the Computer Science Department in Trinity College. Participants were presented with thirteen images which showed a subject undertaking an action. They were asked to choose whichever of two choices best described the picture for them e.g. if the image was of a ‘baby sleeping’ then they were asked to choose between ‘baby’ and ‘sleeping’. The order of these choices was
randomised to prevent participants simply picking the first or second option each time. At the end of the experiment, participants were asked to complete a set of demographic and control questions. These included questions about the languages they spoke in decreasing order of proficiency; and how they rated their proficiency of Irish, if they spoke it. This rating system was taken from the Irish Census form where people are asked to state whether they speak Irish:

1. Daily within the education system
2. Daily outside the education system
3. Weekly
4. Less Often
5. Never

This allowed for comparisons of results from participants with different proficiency levels, if necessary. They were also asked which language they counted in to see again which language was their L1.

4. Results

A primary look at the results from this experiment seems to show arbitrary choices between subject and action, regardless of language. Indeed, we can see in the table below that one non-Irish speaker chose action over subject nine times. In order to test the results properly, statistical analysis is necessary again.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Has Irish?</th>
<th>Proficiency</th>
<th>Action choices</th>
<th>Subject choices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Y</td>
<td>Daily-in</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>Y</td>
<td>Daily-in &amp; out</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Y</td>
<td>Less often</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>N</td>
<td>Never</td>
<td>2</td>
<td>11</td>
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<tr>
<td>5</td>
<td>Y</td>
<td>Never</td>
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<td>Never</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>Y</td>
<td>Daily-in</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>N</td>
<td>Never</td>
<td>8</td>
<td>5</td>
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<td>N</td>
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<td>5</td>
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<td>N</td>
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<td>2</td>
<td>11</td>
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<td>11</td>
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<td>Never</td>
<td>3</td>
<td>10</td>
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<td>Y</td>
<td>Daily-in &amp; out</td>
<td>4</td>
<td>9</td>
</tr>
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<td>Never</td>
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<td>1</td>
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</tr>
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<td>N</td>
<td>Never</td>
<td>7</td>
<td>6</td>
</tr>
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<td>18</td>
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<td>Y</td>
<td>Weekly</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>22</td>
<td>N</td>
<td>Never</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>23</td>
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<td>Daily-in &amp; out</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>24</td>
<td>Y</td>
<td>Daily-in &amp; weekly</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>Y</td>
<td>Daily-In &amp; out</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>26</td>
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<td>Daily-In &amp; out</td>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>27</td>
<td>Y</td>
<td>Daily-In</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>28</td>
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<td>Never</td>
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<td>Daily-In</td>
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<td>Daily-In</td>
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<td>8</td>
</tr>
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<td>Y</td>
<td>Daily-out</td>
<td>8</td>
<td>5</td>
</tr>
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<td>Y</td>
<td>Daily-out</td>
<td>3</td>
<td>10</td>
</tr>
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<td>N</td>
<td>Never</td>
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<td>9</td>
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<td>Y</td>
<td>Daily-In &amp; out</td>
<td>4</td>
<td>9</td>
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<td>Daily-In</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>36</td>
<td>Y</td>
<td>Daily-In &amp; out</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>37</td>
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<td>3</td>
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<td>7</td>
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<td>Never</td>
<td>4</td>
<td>9</td>
</tr>
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<td>42</td>
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<td>Daily-In &amp; weekly</td>
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</tr>
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<td>43</td>
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<td>46</td>
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<td>48</td>
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<td>Daily-In &amp; out</td>
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<td>52</td>
<td>N</td>
<td>Never</td>
<td>2</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 6. Initial results of VSO – SVO experiment
The following table demonstrates the actual differences between the Irish and non-Irish speakers.

<table>
<thead>
<tr>
<th>Irish speaking participant #</th>
<th>Score - actions</th>
<th>Score – subject</th>
<th>Non-Irish speaking participant #</th>
<th>Score - actions</th>
<th>Score – subject</th>
</tr>
</thead>
<tbody>
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<td>12</td>
<td>4</td>
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<td>11</td>
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<td>6</td>
</tr>
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<td>2</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>51</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>52</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
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<td>250</td>
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<tr>
<td>Mean</td>
<td>3.76</td>
<td>8.56</td>
<td>3.7</td>
<td>9.26</td>
<td></td>
</tr>
</tbody>
</table>

Table 7. Differences in choices between Irish and non-Irish speakers
5. Statistical Analysis

Statistical analysis is required again to test the results from these experiments and to see if they are statistically viable. Based on the flowchart in the book, it would appear that the parametric unrelated $t$ test is best suited to testing this experiment. This test is designed to test responses for an unrelated design with different subjects who are used in two conditions.

5.1 Experimental hypothesis

When a group of Irish speakers are asked to choose between an action and a subject to describe an image their choice will reflect the syntactic structure of their language, i.e. they will choose the action because Irish is a VSO language. When a similar group of non-Irish (English L1) speakers are asked to carry out the same task, they will choose the subject instead of the action, reflecting the SVO nature of English. This hypothesis is a one-tailed hypothesis as it makes a prediction in one direction only, i.e. the syntactic structure of a language will be reflected in the choice made by speakers of that language to describe a particular image.

5.2 Null hypothesis

When a group of Irish speakers and a group of non-Irish (English L1) speakers are asked to choose between an action and a subject to describe an image, the choices made will reflect the structure of the language due to random fluctuations in people’s performance.

5.3 The independent variable

The independent variable is the choice between the two descriptions for the image.
5.4 The dependent variable

When describing the objects, will people choose the option which reflects the syntactic structure of Irish?

5.5 Experimental condition 1

The objects were presented to a group of Irish speakers.

5.6 Experimental condition 2

The objects were presented to a group of non-Irish (English L1) speakers.

5.7 Rationale

The aim of this test is to find out if there are significant differences in the participants’ results under the two conditions. It is not possible to compare scores for each subject as they only produce a score under one condition (Greene & D’Oliviera 1999:51). The expectation is to see a higher choice for action in people with Irish than in those without.

5.8 T – test (unrelated)

The t test is a parametric test which is used to test when there are two conditions and one independent variable for different subjects doing these two conditions.

All scores were totalled and then squared. Then the mean for each condition was calculated. Each of the individual scores for each condition was squared and then the squared scores for each condition were totalled separately. The number of subjects in each condition was also noted. The following equation was used with the figures worked out previously substituted into it.
Figure 10. Formula for $t$ test unrelated

$M_1 = \text{mean of condition 1}$

$M_2 = \text{mean of condition 2}$

$\sum_1^2 = \text{sum of the squared scores for condition 1}$

$\sum_2^2 = \text{sum of the squared scores for condition 2}$

$(\sum x_1)^2 = \text{sum of the total scores for condition 1 squared}$

$(\sum x_2)^2 = \text{sum of the total scores for condition 2 squared}$

$n_1 = \text{number of participants in condition 1}$

$n_2 = \text{number of participants in condition 2}$

The table below shows how these values are taken from the results of the test.
<table>
<thead>
<tr>
<th>Experimental Condition 1</th>
<th>Experimental condition 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scores (x₁)</strong></td>
<td><strong>Squared scores (x₁²)</strong></td>
</tr>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
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<td>3</td>
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</tr>
<tr>
<td><strong>Total</strong>: 94</td>
<td><strong>Square total T₁</strong>: 325</td>
</tr>
<tr>
<td><strong>Mean</strong>: 3.76</td>
<td><strong>Square mean</strong>: 13</td>
</tr>
</tbody>
</table>

Table 8. Table showing results required for t test

\[ M₁ = 3.76 \]
\[ M₂ = 3.7 \]
\[ \sum t² = 325 \]
\[
\sum x^2 = 378
\]
\[
(x_1)^2 = 8836
\]
\[
(x_2)^2 = 10,000
\]

\[n_1 = 25\]
\[n_2 = 27\]

### 6. Results

When the above values are substituted into the formula we find that \(t = 0.33\)
This is the ratio between predicted differences and total variability. We now check the
value of \(t\) in the table relating to the \(t\) test (which is available at the back of the Greene
and D’Oliviera book), the value we have must be equal to or greater than the values in
this table. As there are two groups of participants, a \(df\) is calculated separately for each
and then added together using the following formula

\[
Df = (n_1 - 1) + (n_2 - 1)
\]

The \(df\) value for this experiment is 50, thus this is the value we use to see if the result for \(t\)
is statistically significant. In order for \(t\) to be significant we need to have a value of 1.303
or greater, thus our value of 0.33 is clearly insignificant.

From this we can conclude that this test does not hold statistically. Thus we can
see that in the test above there is no significant difference in the choices made between
Irish and non-Irish speakers.

### 7. Discussion

The main problem with the experiment undertaken above is that only one of the
Irish speaking participants listed Irish as their L1. This means that all of the Irish speakers
had English as well as Irish and this may account for the lack of difference in the results
obtained between the two groups. Both groups had almost identical average score in their choices of both action and subject. In fact one non-Irish speaker chose action twelve times and subject only once which would point towards an arbitrary choice. Certainly it would be interesting to test this experiment with a group of Irish monolinguals and a group of English monolinguals to see if there were any significant changes, the problem with this is that Irish monolinguals are difficult if not impossible to find.

Another solution would be to undertake this experiment with speakers of another VSO language such as Classic Maya or Formal Arabic and monolingual speakers of English or another SVO language such as French to see if any significant differences were found. As this test did not consider the implications of the Irish speakers also speaking English, it would also be interesting to have a test with Irish monolinguals, English monolinguals and Irish L1 learners of English, to see what sort of results could be found. It could be argued in this case that the Irish speakers’ knowledge of English affected their capability to reflect the syntactic structure of Irish.
Chapter 6

Conclusion
6.1 Conclusion

This paper investigates the Sapir-Whorf Hypothesis and Linguistic Relativity. First we looked at the Sapir-Whorf hypothesis and defined the strong and weak versions of it. Some of the ideas presented by the “original” proponents of linguistic relativity were outlined. Research by various neo-Whorfianists, as they have been dubbed, was presented. It would appear that there is certainly some support for the principle of Linguistic Relativity, based on the findings in such research.

We then looked at the area of bilingualism and second language acquisition to see if there were any implications for Linguistic Relativity in this area. Research in this area is relatively new, yet many linguists have explored and studied it. This research focuses on the difference in concepts and choice between monolinguals and bilinguals or L2 users. The research in this paper seems to point to some sort of change in cognition based on the level of the learner’s second language.

In this paper, some experiments were carried out, in order to see if the results presented in the previous research could be supported. Neither of the experiments presented any statistically significant findings. However, there is room for improvement in how they were undertaken. They need to be enhanced, particularly in their implementation. With the experience in testing and analysis gained in this series of experiments, future work might reveal significant findings. It might be better to carry out the experiments face to face with the participants, rather than having anonymous participants take part in an online system. There needs to be more participants and more control over external factors which may skew the results. Possible work in the future relating to the two experiments that I undertook in this paper would be to use images in the grammatical gender test which are similar to those used by Benedetta Bassetti. These are black and white, hand drawn pictures. This would control for colour responses and also control any external factors in the image that may affect the choice made by the participant. In the grammatical gender experiment outlined above, a lot of participants supplied answers based on colour. Another possibility would be to carry out some practice sessions, explaining to people what an adjective is and/or giving participants a selection of adjectives to use e.g. three feminine and three masculine and asking them to
select the ones that they think are best suited. With relation to the test on VS0-SVO, this experiment might show more favourable results if the Irish speakers had been monolinguals. It is extremely difficult to find Irish monolinguals, so it might be better to carry out the experiment with an alternative VSO language. Finally, in the area of statistical analysis, it would be favourable to carry out numerous statistical tests on the results gathered from each experiment. This would result in plentiful evidence either for or against the experimental hypothesis. In the experiments undertaken in this paper, we could carry out some ANOVA tests on the results for further investigation.

One of the main things that we can conclude from this paper is that the strong version of the hypothesis that language determines thought has no support in the modern world of linguistics. However, there is quite a lot of evidence for the effect that language has on thought. There has been a lot of positive support for Linguistic Relativity; but there is certainly a need for a lot more research in the area of language and thought, particularly from the perspective of the effects on people who speak more than one language.
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Appendix A

Apple

Bee

Bicycle

Bin
Book

Bridge

Car

Chair

Clock
Dog

Football

Fork

Kettle
Cup/Mug

Pen

Telephone

Spoon
Tree

Umbrella

Glass
Appendix B

Cats fighting

Child singing

Fish swimming

Giraffe running
Horse jumping

Baby kissing

Bird flying

Cow eating
Dog drinking

Monkey swinging

Nun praying

Policeman cycling
Soldier walking