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The Influence of Native Language on our Cognition

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Dedication

For those who left footprints on my heart: Father and Brother God bless their souls

Abstract

The interaction between language and cognition is an extremely complex issue. Many disciplines have struggled to unravel that issue. In recent times, a debatable question has arisen in cognitive sciences regarding how and whether natural language alter cognition. Long lasting debate about this issue has not provided a conclusive result. In this study, I carried out random block experiment design to examine the effect of one's language on thinking . The experiment was designed to evaluate the influence that natural language is operating on the cognition of native Arabic and French speakers on categorization of inanimate items. Population of the study consisted of 66 participants: 33 native speakers of Arabic (20 males and 13 females) and 33 native speakers of French (16 females and 17males). Participants were asked to attribute masculine and feminine voice to the inanimate pictures presented in psychological tool Super lab. The findings show that both groups of participants assign voice according to the grammatical gender of their native language. In the second experiment participants were asked to choose between action and subject as the best description to the pictures. The findings show that both groups of participants' average score in their choices between action and subject match the syntactic structure of their native language. The statistical results prove that native language has an impact on cognition of its speaker. These findings support Whorfian hypothesis which is known as linguistic relativity.

KeyWords: Language, Cognitive Sciences, Native language, Radom block design, Categorization, Voice attribution, Linguistic relativity.

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List of Abbreviations

NL: Natural language

LOTH: Language of thought hypothesis

LR: Linguistic relativity

IFF: If and only if

DF: Degree of freedom

SD: Standard deviation

ANOVA: Analysis of variance

FMRI: Functional Magnetic Resonance Imaging

SAE: Standard Average European

VSO: Verb Subject Object

SVO: Subject Verb Object

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General Introduction

What language do we think in? The response to this question mystifies many people over these years whether we think in natural language or a non-conscious innate mental language called mentalese. Carruthers (1996), labelled the latter view; mentalese communicative approach. The communicative leaders relegate natural language as a tool of communication, no insight in to the mind operations. The natural language is just a language that articulates thoughts encoded in a language of thought called mentalese. This view is defended by philosophers such as Fodor (1975-1990) and Steven Pinker (1994). The cognitivists approach, on the other side, view natural language as a language that functions both communicative and cognitive operations. It is a medium in which we conduct our thought. According to this view, many scholars support that natural language is a necessary condition for our thoughts. For instance, Ludwig Wittgenstein stated that “the limit of my language mean the limits of my world “. In other sense, the possess of language determines our understanding and perception of the world.

The most radical form of cognitive conception comes by the linguists Benjamin Lee Whorf (1956) with his principle linguistic relativity. Although this principle caused controversy, but it has exerted a strong impact on most scientific thinking. “the possibility that the language we speak influence the way we think has existed both popular and scientific imagination in the west for well over century” (Lucy1985, Aarsleff 1982). Some of the researchers supported the linguistic relativity (e.g. Brown&Lennberg1954, Lucy 1997, Boroditsky, Schmidt &Philips 2003).

The problem we are about to investigate in this work is not a new one. For instance, Humboldt, who considered language as the very fabric of thought, John Dewey who states

that “(...) the tool of thinking” (Dewey1997, p107). What is the most striking in the issue, is just matter of repetition and redefinition by the new generation of thinkers. The problem did not reach satisfactory results. The focus was too general; language and thought relationship as universal. In this paper, I attempt to ask specific questions: which cognitive domain (spatial, ontological, categorization... and which specific level (memorization, perception, or knowledge representation). The aim of this work is twofold: first, I aim to provide evidence that the phenomena that mentalese is supported to address can adequately be explained by natural language as language of thought. Therefore, language and thought are not separated as Steven Pinker states in *Language Instinct* (1994, p67) and language truly determines our thoughts. Second, I will argue that there is a strong introspective evidence in favor of natural language as the language of thought hypothesis, at least enough to show that our thinking is conducted in natural language. This evidence offers good reasons to support the superiority of the cognitive role of natural language rather than communicative one.

Therefore, this study is prompted to find answers to the following questions: Do native languages influence cognition? Are bilingual task objects ‘categorization distinct from each other? Does this distinction have a relation with the native language? Does gender of the mother tongue have an impact on the objects ‘categorization? Do the syntactic differences affect cognition? Reflecting on the above research questions, we attempt to formulate the following hypotheses: we assume that native language has a strong influence on our cognition tasks. Language differs in so many aspects such as space, time, color, number, classification of objects; therefore, speakers of different languages must think differently. To find answers to our research questions and in order to test the above –mentioned hypotheses, this research is divided into three main chapters. The first chapter I discuss the relation between natural language and thought. This chapter is also broken down into 3 parts. The first part I show that mentalese is the language we think with; the language of thought the language we think with; the language of thought .

I briefly include the notion of the term then move to the arguments that support its validity. The next stage I provide evidence against mentalese which I used forward to support that natural language is the language we think in. At the end of this chapter I conclude by explaining the relation of language and thought between dependency and independency. In the second chapter I tackle the influence of language on thought based on Whorf hypothesis This chapter is divided into three sections. The first section tackles the Whorfian principle. The second section is about Noam Chomsky and Steven Pinker arguments against Whorf hypothesis. In the same section I provide responses to both critics. The last section in this chapter I defend this hypothesis through contemporary researches such as Lera Boroditsky, John Lucy and Slobin. The last chapter is devoted to the practical phase. I will conduct random block experimental design to test the effect of language on perception and decision making. Moreover, we will discuss the research results, then we will suggest some ideas based on providing practical formation for future cognitive sciences research. As far as the conducted methodology is concerned, we have applied statistical analysis. In both cognitive experiments the results prove the significance and validity of our hypothesis ‘native language has an impact on our cognition’

Chapter One:

Natural Language

and

Language of Thought

Introduction

Language of thought hypothesis (hence LOTH) is a view in the cognitive sciences. It describes the nature of thought and thinking. This hypothesis explicits the mental process in the human brain in a form of language. It is developed by Jerry Fodor 1975. LOTH hypothesis postulates that thinking and thought are carried out into mental language. This language consists of a system of representations combined in accordance to syntactic and semantic rules and realized physically in the brain. According to LOTH, the thought 'Ellen is ugly' is expressed in the head of a thinker as sentence. That sentence is not natural language sentence like French or Japanese. It is a sentence of a mental language; mentalese. Thus, it shares the same structure of natural language (hence N.L), following the syntactic rules to give them semantic content. Innateness is the prominent feature of mentalese. It is language we are born with not gained through learning of experience (Fodor1975: p.5). Furthermore, mentalese underlies through process unconsciously.

LOTH sees the brain as a digital device and mentalese is identical to a computational language of a computer. Thus, all the cognitive functions are realized through the construction and manipulation of mental sentences. Language of a computer is about output decoded into string symbols which represent input data. These symbols constitute computer internal language and carry sense depending on the way they are structured. According to Fodor LOTH acts in the same way. Since the mental activity of human being resemble to the computer operations. Computer operates by transforming symbols within them according to certain rules. In other sense, outside input decoded into string of symbols which represent input data. The same thing happens for human particular mental state. It is the job of the brain to contain symbols of a kind of brain language and operates them upon the processes in the brain(Fodor1975).Onthis account,the content of 'Ellen is ugly' is converted into mentalese sentence .

An innate set of rules shapes how mentalese sentences are to be structured, and how they are to be manipulated. Those symbols of mentalese look like N. L. words. Their meaning remains the same (Braddon Mitchell and Jackson 1996: pg. 164). The mentalese symbol that stands for Ellen will always stand for Ellen. The mentalese symbol of ugly will always stand for ugly. According to Fodor, one thing is certain—the brain must contain, or at least instantiate a symbol system. “There must be mental symbols because ... only symbols have syntax, and ... the only available theory of mental processes ... needs the picture of the mind as a syntax-driven machine” (JERRY, 1990, p. 23).

Steven Pinker claims that all thoughts are conducted through a private language of thought, which he calls mentalese. It is an internal system of representation that uses symbols to represent concepts and arranged according to some consistent system (Pinker1994: p.71). For Pinker thinking process is to generate new sentences from old ones through computation (Pinker1994: p.73-74). Moreover, he views reasoning ability of the human mind as compatible to the computing ability of Turing machine. “By looking at how a Turing machine works, we can get a grasp as what it would mean for human mind to think in mentalese as opposed to English” (Pinker, 1994, pp. 73-74).

I Mentalese as Language of Thought

LOTH postulates that all thoughts are in universal private language. This language consists of a system of mental representations. Each mental representation is a symbol to corresponding thought. These mental representations comprise the objects of propositional attitudes; fear, hope; beliefs. Propositional attitudes are thoughts described by such sentence form:

<u>Jane</u>	<u>believes that</u>	<u>she is smart</u>
Subject of propositional attitude	verb of propositional attitude	object of propositional attitude

Language of Thought has a compositional feature. That is, the meaning of a complex expression depends on the meaning of its part. The mental representations of LOT are combined in accordance to the semantic and syntactic rules. Whereas, in N.L each sentence has its individual parts e.g. ‘Jane’, ‘ate’, and ‘apple’. Each part has a syntactic feature that combines to form a sentence. The syntax consists of the rules of representational system these rules control which combination of words is a sentence and how a sentence is formed. The sentence is qualified as sentence only if these rules are obeyed e.g. ‘Apple John ate’ syntactically is incorrect. It disobeys the syntax rules. The rules that give the mental representations meaning, the semantic rules. The rules that governed behind the syntactic composition rules. On this account, each of the syntactic components such as John and apple has its own meaning, so the semantic rules are fulfilled. The semantic rules explicit what is meant by each of these syntactic component to form a whole sentence with a new semantic meaning. Hence, a full sentence is a syntactic combination, formed according to the syntactic rules of the representational system, and also a semantic one. Its parts are combined to form a whole sentence with a new semantic meaning (Hutchinson, 2002).

According to Fodor (1975), LOT is innate and consist of body of information in which items are interrelated by computational operations. It is dissimilar to N. L and not conventional.

1. Supporting Arguments to Mentalese as Language of Thought

A. First argument: Animals think

For Fodor (1975) the effective way to prove that we have representational system for performing computations that constitute cognitive processes is to suggest that the required representational system is natural language. Indeed, the appealing is that “it allows the theorist both to admit the essential role of computation (and hence of representation) in the production of behavior and to resist the more scarifying implications of the notion of a language of thought” (Fodor, 1975, p. 56). Fodor points out that the supposition of a natural as a medium of thinking cannot lead us to any progress ,whereas it leads to rejection “The obvious (and, I should have thought, sufficient) refutation of the claim that natural languages are the medium of thought is that there are nonverbal organisms that think...” (Fodor, 1975, p. 56).

Fodor’s point of view based on his justified analysis of rational thought processes; concept learning, considered action, and perceptual integration. Since these processes are computational, they presuppose a representational system to perform the computation. Therefore, any organism that exhibits rational thought processes must possess an internal system of representation. Since these processes are computational and achievements of preverbal children and infrahuman organism. Thus, the representational system of preverbal and infrahuman organism cannot be natural language.

Fodor (1975) postulates that language-using human, infrahuman, and preverbal children share the same processes his assumption based on the homogeneities of the mental capacity of both organisms what he meant by homogeneities is the identical representational system that language –using human, and other organism use for thinking “there are homogeneities between the mental capacities of infraverbal organisms and those of fluent human beings which, so far

as anybody knows, are inexplicable except on the assumption that infraverbal psychology is relevantly homogeneous with our psychology” (Fodor, 1975, pp. 57-58). Fodor offers some evidences to support his claim concerning the homogeneity of representational system between organisms:

1-Nonverbal organism and verbal humans have greater difficulty in learning disjunctive concepts than negative or conjunctive concepts (Fodor 1975, pp. 57-58).

2-The similarity in competences between nonverbal organism and verbal organisms leads to prove the similarity of representational systems.

These evidences make conclusion that verbal humans and nonverbal organisms use the same representational system for thinking which cannot be natural language.

B. Second Argument: Innateness

Fodor states that language of thought is distinct from any natural language. In order to prove his view, he hypothesized that the innate predicates in terms which N. L predicates are learned are the predicates of LOT. He argues that learning predicates of N.L involves learning its semantic properties of its predicates by learning generalization that determine their extension.

In this sense Fodor (1975) states that:

Learning what the predicates of a language mean involves learning a determination of the extension of these predicates. Learning a determination of the extension of the predicates involves learning that they fall under certain rules (i.e. truth rules). But one cannot learn that P falls R

under unless one has a language in which P and R can be represented... But first languages are learned. Hence, at least some cognitive operations are carried out in languages other than natural languages. (Fodor J., 1975, pp. 72-73)

For instance, learning the word 'chair' requires learning "if the word is truly predicated of something" if and only if it is a chair". That is, learning the truth rule of the form

$$\ulcorner y \text{ is a chair} \urcorner \text{ is true iff } Gx$$

G here is predicates of one's internal code; LOT.

P is predicate in N.L

Here in the truth rule G must be coextensive with chair. x and Y should share the same referent. If the 'chair is portable seat for one' is true, it is obvious that no one has mastered 'Y is chair' unless it falls under the truth rule 'Y is chair is true iff x is portable seat for one'. Fodor abbreviates all this in this formula 'S learns P only if S learns a truth rule of P'. The crucial point here G must be something comprehensible by the learner, but when a child starts learning their first words of their first language, they do not understand coextensive predicates either in the first language or another language. Hence, G must be innate predicate." Trivially, one cannot use the predicates that one is learning in order to learn predicate that one is using" (Fodor, 1975, pp. 89-90). The predicates in terms of which first natural languages are learned must not belong to any natural language. They are innate. Since natural language predicates are learned in relation to the innate predicates. Then, these innate predicates must be the ones used in the formulation of hypothesis to learn N.L predicates. Since LOT is the system of representation in which hypotheses are formulated /confirmed. This entails that these innate

predicates that are used to learn N.L predicates must be LOT predicates (Fodor, 1975, pp. 83-93).

Two points were proved by Fodor (1975). The first one, the innate predicates are distinct from natural language predicates. The second point, innate predicates are LOT predicates. It follows that predicates of LOT are distinct from N. L predicates. Hence, LOT is distinct from natural language.

C. Third argument: Anti-Bootstrapping

This argument is against Piaget Bootstrapping model (Brian Beakley, 1992, p. 335). Piaget sees that a child is born and equipped with a mental faculty. This innate capacity forms the basis of language. Fodor arguments denies this possibility of using one part of natural language to learn another part which has no relation to the first part. Fodor in connection to this he says that:

...foothold in the language having once been gained, the child then proceeds by extrapolating his bootstraps: The fragment of the language first internalized is itself somehow essentially employed to learn the part that's left. This process eventually leads to the construction of a representational system more elaborate than the one the child started with, and this richer system mediates the having of thoughts the child could not otherwise have entertained. (Fodor J. , 1975, p. 93)

Fodor reasons as follows: The truth rule cannot be formulated containing predicates coextensive to the one to be learned. Learning the predicates in a N. L requires one to have a corresponding concept in the LOT. The possibility of learning a natural language based unless we have an innate language of thought that is just rich as that natural language. Fodor justifies his view as follows. If a natural language predicate P is learned in terms of another predicate Q in the same natural language, the language of thought can still express P, for the predicate Q in terms of which P is learned.¹

Fodor(1975) says that:

...have been saying that one can't learn P unless one learns something like, 'P is true iff Gx', and that one can't learn that unless one is able to use G. But suppose G is a predicate (not of the internal language but) in the same language that contains P... Nothing can be expressed in a natural language that can't be expressed in the language of thought. (Fodor J. , 1975, p. 92)

Any predicate we learn has an appropriate predicate in LOT, hence, LOT is expressive as any other language.

¹ P and Q are from the same natural language because Fodor concern here is the first language acquisition.

2. Arguments Against Mentalese as Language of Thought

A. Response to Animal Think

Fodor claims that humans share representational processes with nonverbal organism homogeneities between mental capacities. Verbal humans possess a rich representational system which entail great mental capacities of verbal humans. Advanced representational system of verbal humans would have to be as rich as any N.L, since it may express the predicates of any N.L as Fodor claims (Fodor J. G., 1975).

Chimpanzees exhibit some of the cognitive capacities that we have, but does not mean they have rich representational system as N.L. Nonverbal organisms could have representational system. They use it for thinking, but are not linguistic representational. The homogeneity that Fodor mentioned explains the nonlinguistic representation that human share with nonverbal organisms.

“This is interesting finding [the homogeneities of thought between verbal humans and non-verbal organisms] suggests that the representational systems of adults, infants and animals are similar, but does not imply that animals' and infants' representations are similar to our linguistic representations.... the finding may show only that adult humans share some non-linguistic representations with infants and animals” (Kaye, 1995, pp. 102-104).

Another argument against animals thinking. Fodor claims that the rules to which LOT operates are truth preserving. If we start thinking with true assumptions, we need to end up

generating conclusion that are also true. This feature is not possible in case of nonverbal organisms. The Rational process according to Fodor (1975) based on hypothesis formulation /confirmation. In case of animals it is a matter of intentionality. “There is no reason to suppose that just because animals demonstrate similar behavior (intentionally characterized) to humans in certain situations that animals require a linguistics representation system” (Davidson, 1984, pp. 155-170).

B. Response to Innateness Argument

According to Fodor1975, early language acquisition is mediated by internal system. Fodor argument skip the fact that once natural language is acquired; it cannot be the medium of thinking. Thus, that the internal system is not a linguistic system. The predicates of N.L are learned by formulating a hypothesis involved both innate predicates and N.L predicates. As humans our mental capacity is finite. Since the internal representational system is innate not gained by experience entail its finite. Then, not all of N.L predicates are infinite can be coextensive with innate predicates. In other words, the finite stock of innate predicates cannot be coextensive with infinite N. L predicates. Some of N. L predicates must be coextensive with combination of other predicates. This combination generates another predicates. However, once the stock of N. L predicates is learned, natural language imposes structure on them. This combination enables the fact of learning more natural language. In this case, Fodor cannot refute that this predicates combination is a combination of N.L predicates to learn N.L predicates.

We can sum up that learning N.L predicates which are coextensive with other predicates requires the use of these predicates combination. Furthermore, we can assume that the internal representational system is not productive or systemic. Since the combination is N.L predicates combination to generate other predicates. To some extend natural language is represented as a

medium of thought as the internal representational system was for learning the early language acquisition.

C. Response to Anti-Bootstrapping Argument

Fodor (1975) states that every predicate of N. L must be coextensive with a predicate in the internal representative system. Every N. L predicate must be learned through the truth rule hypothesis. For Fodor the first predicates we learn must be learned in terms of the internal representational system, since we cannot learn them in coextensive to unknown predicates. N.L predicates learned in terms of coextensive predicates in internal representational system which can be combined to form new predicates that are expressed in internal representational system, because internal representational system cannot be combined. So, it is possible to learn N.L predicates not coextensive with any predicates in the internal system.

Fodor insists on learning N. L predicates in coextension with innate predicates. For instance, learning N.L predicate G in terms of predicate Y of N.L. Y must be coextensive with the innate predicate Fodor did not take into account that Y could be generated through combination of other N. L predicates that are coextensive with the internal representation system as we have seen in the previous response to innateness. There is a possibility of acquiring terms of natural language based on terms we know. This increases the expressive force of natural language beyond the expressive force of internal representational system.

Another evidence stands against Fodor presumption that all predicates must be learned in terms of the internal representational system, is about logical connectives' learning.

Logical connectives 'learning in not possible with Fodor hypothesis. In fact, the logical connectives need not be learned at all, at least not in the sense of knowing-that. We all master

their use, a kind of knowing-how, which we can do in terms of a natural language directly. In this account, Fodor proposed use-theory of meaning; knowing-how, for logical connectors (Fodor J. , 1990, pp. 110-111).

In this account he says that:

What about Logical Vocabulary? I don't know what about the logical vocabulary. •• I'm inclined to think that maybe there is no objection to the idea that “+”, “and”, “all” and the like have the meanings they do because they play a certain causal role in the mental lives of their users... Gilbert Harman somewhere suggests that to be a logical word just is to be the sort of word of which a use-theory of meaning is true. This proposal strikes me as plausible. ... I know of no principled reason why some such proposal shouldn't be endorsed. (p.110-111)

Logical connectives are used in natural language to combine elements of that natural language. there need not be internal representations corresponding to the logical connectives of natural languages² .

² learning the logical connectives could not be a kind of learning-that. That is, we need not to suppose that the internal representational system possesses anything corresponding to the logical connectives to explain how natural language connectives are acquired.

II Natural Language as Language of Thought

Fodor by establishing language of thought denigrated the value of the natural language. His hypothesis was supported by the non-linguistic thinking and its innateness. As we have seen the responses to his arguments, natural language is the best explanation to LOTH nature. Natural language is not just a communicative device as Fodor stated it is the medium in which thinking occurs. This postulation was supported by Fodor himself, who believes in the existence of mentalese acknowledgement the importance of N.L in shaping our world view.

“...I am not committed to asserting that an articulated organism has no cognitive advantage over an inarticulate one. Nor, for that matter is there any need to deny the Whorfian point that kinds of concepts one has may be profoundly determined by the character of the internal language that one speaks” (Fodor J. , 1975, p. 93).

1. Supporting Evidences of N.L as Language of Thought

A. Cognitivist Approach

The role of natural language is not only transmitting the thought humans have. Carruthers and Wittgenstein (1996) suggested that one of the potential role of N.L is the cognitive one. Its function far from establishing relationships or being vehicle of thoughts.

Natural sentences actually are thoughts demonstrated in form of inner speech, external speech ,and written sentences (Carruthers, 1996).He rejects that N.L sentences are external encoding of hidden thought (Fodor J. , 1975).On this account, Carruthers suggests that the written activity carry much similar as the internal and external speech. We do not form thought

and translate them in natural language to be spoken or written as Fodor said. The same thoughts are used for speaking and writing. He supported his point of view by the facility of entertaining thoughts in inner speech and external speech while we switch between modes of operations (inner speech/external). It is always done in natural language. Furthermore, thinking is about a sequence of N.L sentences that are spoken externally and internally. “the experience of thinking may be just the experience of saying” (Wittgenstein, 1958, p. 43).

Supporters of mentalese stated that language is a communication device not needed for thinking “the function and purpose of natural language is to facilitate communication and not ...to facilitate thinking” (Peter Carruthers, 1998).

We have already suggested that much of our thinking is carried out in natural language through rejecting Fodor arguments. Moreover, I think that for us as humans, one of the prominent roles of natural language is the role it plays as a medium for thinking. I will now provide evidence as a defense of this idea.

B. Introspective Evidence

We all have experienced an internal monologue. If we focus deeply we notice that our thoughts are formed in sentences of N.L. This inner speech sometimes is a replay of old events or conversations with people. Most of the time making future plans or solving problems. For instance, I have entered a shop. I saw elegant shoes. I decided to buy them. While I was going to pay, I discovered my purse was not with me. without panic suddenly I remembered that my usual act is to put extra money not in purse but in my jeans pocket. These stream of thoughts took the form of N. L sentences in this way “Oh, dam it. No money. What I will do? Where did I lose my purse? I need to buy them ...I have to own these shoes ...I usually put money

elsewhere...” The final part of thought will occur as an image of me putting money in my jean pocket.

Since the stream of thought began with vocal not images , it is obvious that language plays a dominant role in the thought process (Carruthers, 1996, p. 36).He states that N.L sentences are the reason for image augmentation. The only reason that images in some cases carry less information or much information. If we apply Carruthers suggestion on the previous stream of thought. It will be difficult to identify if this image, me putting money in pocket, is recent one or just an old event. Thus, the sentence completed the thought and gave it the meaning.

Another kind of inner speech proves that speaking is not for communication purpose. Children monologue as Jean Piaget calls it Egocentric speech (Piaget, 1932).

In the same account Piaget (1932) states that:

Egocentric functions are the more immature functions, and tend to dominate the verbal productions of children 3-7 years of age, and, to a lesser extent, children 7-12 years. In this form of speech, a child does not bother to know to whom he is speaking nor whether he is being listened to.... This talk is egocentric, partly because the child speaks only about himself, but chiefly because he does not attempt to place himself at the point of view of his hearer. Anyone who happens to be there will serve as an audience. ((Piaget, 1932, pp. 9-10).

Children speech occurs with or without audience presence. This happens to adults when no one is around. These N.L sentences are uttered not for communication goal, they are used for other reasons possibly thinking (out loud thinking).

If we ask any person how do you usually think? The immediate reply will be in natural language. The fact of being aware that reasoning process is conducted in N.L does not entail that the non-conscious reasoning is conducted in mentalese. Since it is language behind the scene (Fodor J. , 1975).There are situations when we carry out reasoning activities without being aware. This implies that N.L sentences are there, but not stored in memory or not present in conscious.

Introspective evidence succeeds to clarify the role of N.L. It helps us to conclude that our inner speech is used for thinking and our thought are conducted in N. L sentences. Natural language plays a vital role in human thinking. Introspective evidences are concerned with the vocalized human. The coming up evidence which supports more that our thoughts are done in natural language is from Helen Keller testimony.

C. Helen Keller Testimony

She is a child who suffered from fever at age 19 months. She lost her sight and hearing between one year to two years. Her disability prevents her to acquire language as normal children. She remained languageless till age 7years.In this period she was taught to use language of touch. Her teacher used to trace the name of object on her palm after exposing Keller to it. By time Keller mastered her language of touch. After learning language Helen Keller wrote books explaining her life before and after knowing language. The essential remarks on Keller writings her insistence on the role of language in her thinking. She described herself as nonexistence thinking being before becoming a language user.

“Before my teacher came to me, I did not know that I am. I lived in a world that was a no-world. I cannot hope to describe adequately that unconscious, yet conscious time of nothingness. I did not know that I knew aught, or that I lived or acted or desired. I had neither will nor intellect” (Keller, 1909, p. 141).

Previously we have defended the role of language on cognition through personal introspective. The following testimony of Helen Keller-her testimony-is the best evidence. The only reason is that she has experienced the fact of being languageless and acquiring language. Before she developed a languageless, she claims that she had no inner life and her behavior was instinctual like animal (Keller, 1909, p. 143).Furthermore, Keller says that before I possessed language I had no sense of identity. She started experiencing inner speech directly after acquiring language. It took-inner speech-form of a feeling of words spelled out on her hand (Keller, 1909, p. 145).Her analogy between her linguistic state and pre-linguistic existence makes the role of N.L on thought more sophisticated .On top of that ,Helen Keller case gave a new insight to the role of N.L in our lives. The productivity and systematicity of our thought rise by learning and acquiring language, for Keller, no evidence for existing such features before N.L come along. From Helen Keller testimony we can claim that the feature of thought-productivity and systematicity- can only be explained if we accept the hypothesis that N.L is the language of thought.

D. The nature of Human Thought

Our thought process exhibits feature of productivity and systematicity after assimilation with natural thought. Thought is productive means the application of rules on the existence of

thoughts to generate another thought. We say thoughts are systematic means that thoughts are set of symbols rearrange under system to form a new thought with different meanings. Fodor believes that productivity and systematicity of thoughts should be explained by mentalese it is the only language that can account for thoughts features .His reason for positing mentalese than natural language as language of thought was related to human infants and non-human animals (Fodor J. , 1975, pp. 56-58).This entails that pre-linguistic humans thoughts should share the productive systematic properties of well-developed human thought. For Fodor productive and systematic thought for infants is to learn natural language through forming hypotheses about the meanings of words and then testing those hypotheses. (Garfield, 1997, p. 429) in his empirical experiment proved that animals and human infants' thoughts are not productive or systematic in other sense. These thought are different. Harman (Harman, 1973) in this account suggests that natural language may provide different thinking for human at a different stage of development.

Jean Piaget work with human infants proved that the essential role of natural language on our thought is productivity and systematicity. Piaget states that children start acquiring symbolic system of representation at a specific stage of development. He characterized four stages of cognitive development. The first stage is the sensorimotor stage. It is the initial phase of development to children experience the world and gain the knowledge through the senses and motor movements It last from birth to age two years. In this period child knowledge is very limited to his/her motor activities and sensory perceptions. They only use primitive skills and abilities (listening, sucking, and looking) to recognize the environment. His/her cognitive system is off, limited to motor reflexes.

According to Piaget observations, a child continues development till he/she starts activating the cognitive ability and acquiring the object permanence. It is child understanding that objects

or person continue to exist even though they are moved out of sight. Piaget before this stage, he noticed that a child acts as if the object or person vanished when they are not perceived (Piaget, 1953, p. 211) e.g. Game of Peek-a-boo child is interested in the object while it is perceived, but if it is hidden (even while he watches), the child will not seek after it. However, once a child understands the object permanence (between 3 months and 1 year) child will realize the existence of object and look after it. For Piaget stage of object permanence is the stage of beginning of symbolic thoughts for child. A child starts to develop symbols for events or objects. S/he begins to understand his /her environment through the mental operations rather than actions. Child starts holding concept in mind and use specific word to specific object. This emergence of symbolic language give rise to systematic and productive thinking. Mentalese supporters may explain this idea in terms of firing up mentalese language. The only reply to them is that mentalese was not presented as language exists in some stages and vanished in others.

To sum up, human thoughts become productive and systematic with the assimilation of natural language. This proved by Keller Helen testimony and Sensorimotor stage.

Conclusion

In this chapter has provide good reasons to support that NL is the language of thought after the difficulties that mentalese faced. The evidences that support the claim that thinking is done in NL are from the nature of our thought, introspective, and Keller Helen testimony. In introspection, we usually use NL sentences while we describe our thinking. Our expression of the thought resembles our inner speech. Our thinking operates by NL whether thinking is external or internal. Keller testimony proved that thinking is done in NL. These evidences refute the claim that language and thought are separate entities as Steven Pinker said. The relation

between language and thought is matter of dependency. Language affects cognition. Ancient Greeks perspective,1940 Whorf theory argued that language is not separated from thought. Language dictates thought whereas thought influences language. The coming up chapter we will discuss the unconscious influence of language on thought from Whorf perspective and other theorists.

Chapter Two:

Unconscious Influence

of

Language on Cognition

Introduction

There has been a serious debate over the interrelation of language and thought, and the ways in which language determines thought. The claim that an individual's language impacts the way they think or perceive reality is known as The Linguistic Relativism. These influences are causal. Therefore, the different aspects of language could influence different aspects of thought. So, the linguistic relativism is about an assembly of potential influences. In this chapter, I will begin with the historical background of the linguistic relativity principle. In it, I will shed light on the reasons that lead to conceive this tenet. Secondly, I will attempt to reconstruct the arguments which explicitly implicitly stand against this principle accounting on Noam Chomsky and Steven Pinker criticism. The last part in this chapter, includes the contemporary researches which give arguments for the deep impact of language on thought and their interrelation. Specifically, I will rely on Lera Boroditsky research and others such as Slobin and John Lucy. Moreover, to make it clear for readers, this chapter aims to highlight the unconscious influence of language on thought.

I The Historical Background of the Linguistic Relativity Principle

Any concept, idea or thought originates from inspirations. Before dealing with the notion of the concept of linguistic relativity. It is important to analyze the intellectual environment and times where the concept was discussed. This analysis attempts to discover the roots of linguistic relativity principle in earlier works than those of Sapir and Benjamin Whorf. However, it aims to answer the question what triggered the birth of such principle.

Linguistic relativity or what is used to be known as Sapir-Whorf hypothesis is the idea that language a person speaks shapes and influences the way they think. Edward Sapir wrote that:

“No two languages are ever sufficiently similar to be considered as representing the same social reality” (SAPIR, 1949, p. 69).

Thus, the relation of language and thought has been discussed and researched by various scholars throughout time including Plato, Socrates, Aristotle, and De Saussure (Penn, 1972, pp. 44-45). Aristotle began the research on how language can represent the concepts in our mind. Language is seen as symbolic system from Aristotle perspective. Penn (1972), however, ventures into classical antiquity work. Her conclusion is: “It has been shown that Plato first advocates the notion that thought can be influenced by language. Aristotle took a position similar to Plato’s on the relation of language to thought, but the idea that language influences thought can be found in Aristotle writings’ only by implication “(Penn, 1972, p. 44).

In 18th century Germany was the starting point for raising the question whether thought is language dependent or not. Scholars such as Johann Gottfried Herder (1744-1803) Johann Georg Hamann (1730-1788) concerned with the ideas of language and thought (Lucy, 1992). Their ideas were the platform for the work of Germanic linguist Wilhelm Von Humboldt, Franz Boas Edward Sapir and Benjamin Whorf to make up what is known now the linguistic relativity.

Von Humboldt was well known as a Germanic Philosopher and linguist in the 19th century. He was the first representative of language and mind relationship with his ideology Weltanschauung known as world view hypothesis, “he was ... the first to emphasize the magnitude between cultures as revealed in their languages” (Penn, 1972, p. 19). Von Humboldt asserted that speakers of different languages have varying views of the world we live in (Koerner, 2007). The following quote illustrates Humboldt point view : “le monde dans lequel

nous vivons est [...] exactement celui dans lequel nous transplante l'idiôme que nous parlons “ (Voss, 2017, p. 263)¹.

Furthermore, language and thought were interchangeable, for Humboldt, they were indistinguishable related (Penn, 1972, p. 20).

He considers language as the very fabric of thought. Language and thought are in close union and must be identical. “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).

Humboldt view is not flexible. His assertion that language and thought are incapable to be distangled, or exist without one another (Penn, 1972, p. 20). His view supported the idea of determinism; that the language we speak fully determines our thought. Humboldt's thought was not the only source of the idea of relativity concerning language. The American linguist Edward Sapir (1884-1936) in collaboration use with his teacher Franz Boas makes another step to linguistic relativity enhancement. However, points out that there exists a direct correlation between the structure of a language and the way people think. In other sense, language constraints thought. In one of his famous quotes Sapir states that:

“Language powerfully conditions all our thinking about social problems and processes. Human beings do not live in the objectives world alone, nor alone in the social activity as ordinarily understood... It is quite an illusion to imagine that one adjusts to reality without the use of language (...)” (Sapir E., 1964, p. 62).

¹ “Die Sprache ist durchas kein blosses Verständigungsmittel, sondern der Abdruck des Geistes und de Weltansicht des Redenden” (Humboldt [1827], VI: 23

Sapir writings and teachings influenced cannot overestimate. He was ¹¹¹¹the one who guided Benjamin lee towards the tradition of research on the causal relation between thought and language.

Sapir writings and teachings influenced cannot overestimate. He was the one who guided Benjamin lee towards the tradition of research on the causal relation between thought and language. According to Lucy (1992, p.25) Benjamin Lee ‘interests in the area of linguistic relativity due to its exposure to ‘Gasoline drum’ situation. He observed that people behave differently around full gasoline drums or empty gasoline drums. In the first, they behave with extreme care whereas they are careless in the second. The word empty 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, p. 135). Whorf linguistic relativity is the prominent one and more influential than the one presented in the above historical background. His linguistic relativity endures three distinctive themes, not present in the previous researches. They are the pillars of his principles “(...) brought to the idea a new and heady mix of an empiricist epistemology, an insistence on the underlying systematicity of language as structured semantical system, an emphasis on the unconscious influence of language on habitual thought” (Gumperz, 1996, p. 21).

*Empiricist epistemology: the idea is that all the knowledge comes from experience. “We dissect nature along lines laid down by our native languages. The categories and types that we isolate from the world of phenomena... which has to be organized by our minds – and this means largely by the linguistic systems of our minds” (Whorf, 1956, p. 239).

*Structuralist assumption: language is understood as a part of the realm of pattern. ‘Quantity and number play a little role in the realm of pattern, where there are no variables but, instead,

abrupt alternations from one configuration to another. (...) what linguistics requires is, (...) exact ‘patternment’” (Whorf, 1956, p. 230).

*Assumption of the unconscious mental life: language affects us as speakers beyond the conscious awareness. ‘The phenomena of language are to its own speakers largely of a background character and so are outside the critical consciousness and control of the speaker’ (Whorf, 1956, p. 211).

1. The Notion of Linguistic Relativity Principle

Linguistic relativism, linguistic relativity principle, or known as Sapir-Whorf hypothesis. It proclaims the influence of language on thought and perception. This entails that the speaker of different languages perceive reality and think differently. Thus, each language has its own worldview. In Whorf words:

“(...) what I have called the “linguistic relativity principle” (...) means, in informal terms, that users of markedly different grammars are pointed by their grammars towards different types of observations and different evaluations of externally similar acts, and hence are not equivalent as observers, but must arrive at somewhat different views of the world” (Whorf, 1956, p. 211).

Whorf 'principle introduces two cardinal hypotheses. Two versions weak/ strong. The word strong and weak has no relation with the strongest scholarly argumentation, but rather to the degree of language impact on thought.

Strong version: language determines the way we think as different language label the world differently ‘language shapes the way we think and determines what we can think’ Weak

version: while languages do not determine absolutely how we think, different language structures influence and lead us to perceive and interpret the world in different ways “(...) of individuals’ thinking differ across linguistic communities according to the language they speak” (Gumperz, 1996, p. 24).

2. Whorf’s Supporting Arguments

A. Linguistic patterning and its influence on thought

The grammar system of a language is a mixture of all the rules. This system can be described as underlying structure of a language. Each language has its own system, distinct grammar, and it is this which makes the difference between them.

The Whorfian research involves the analysis of the large-scale patterning of grammatical categories such as: Plurality-Gender-Tenses and Speech part taxonomy. In 1956 Whorf asserted that we as thinkers, we have a severe difficulty to stand aside from our native language” (...) a habit and a cultural non est disputandum” (Whorf, 1956, p. 138). Simply it becomes part of our nature. We tend to verbalize thoughts, think in our own language to examine the exotic language. Whorf applied alternative perspective of the analysis. He proposed to analyze the native language through the exotic one “we find that exotic language is a mirror helpful to our own” (Whorf, 1956, p. 138). Hence, he examines Hopi language, a tribe of native Americans. The first methodological step he puts all languages that share the same grammar, vocabulary, and syntax. He calls them SAE (Standard Average European). He notices that the plural in Hopi language is not same as English, French, German. What is the plural in Hopi is singular in other languages “since, with respect to the traits compared, there is little difference between English, French, German or other European languages (...)” (Whorf, 1956,p138). The analogy between Hopi and European languages can be lumped into main question:

1- “Are our own concepts of ‘time’, ‘space’ and ‘matter’ given in substantially the same form by experience to all men, or are they in part conditioned by the structure of particular languages?” (Whorf, 1956, p. 138).

a) Time perception and comprehension:

Language influences our perception of time and its understanding. Whorf distinguished three ways to do that:

*Objectifying and subjectifying the terms of plurality and numeration

Whorf 1956 determines two ways how plurality and numeration are applied in SAE:

a) To ‘real’ plurals, called the “(...) perceptible spatial aggregates (...)” (Whorf, 1956, p. 139).

b) To ‘imaginary’ plurals – “(...) metaphorical aggregates (...)” (Whorf, 1956, p. 139).

What he meant by real plural, the plural that we can objectively perceive in one group for example (ten books) we could perceive then in group whereas imaginary plurals; plural that cannot be objectively experienced like in this example (ten days). In other words, we count (ten days) by recycling the one day ten times in our imagination. Impossible to experience (ten days) at once unless it is a matter of imagination, a mental construct group. We generally experience only one day; today (Whorf, 1956, p. 139). According to Whorf, the SAE languages have no discrimination between numbers counted on discrete entities and numbers that are simply a process of counting itself. The latter, ordinary numbers, could be used to refer to the imaginary plural such as days, moment of time etc. The fact that there is no distinguish between real and imaginary plural, it objectifies the latter.

Thus, the concept of time in SAE loses contact with reality of the subjective feeling of becoming later. Time gets treated as a countable quality. Language assists us to imagine time as consisting of so many moments like the units in a length “A length of time is envisioned as a row as similar units, like a row of bottles” (Whorf, 1956, p. 139).

According to both Sapir and Whorf ‘s research the use of plural and cardinals is too different in Hopi language. They are directed to entities that can form an objective group. For instance, (ten books) such utterance does not exist in Hopi “there are no imaginary plurals, but instead ordinals used with singulars” (Whorf, 1956, p. 140). Sentence like ‘she is here for three days’ becomes ‘she is here until the fourth day’. For SAE speaker would not be problem to say (five days is greater than four) because length of time envisioned as a relation between two events in lateness. In Hopi language this sentence is transformed to the (fifth days is later than the fourth) it means they treat time as a series of concrete events.

*Through process objectifying /subjectifying phases of cycles

This process is connected to the previous. It is based particularly on the objectification of all the terms relating to phases cycles etc. According to Whorf terminology, we are dealing with the objectification of the subjective experience of duration. In the SAE languages cycling phases are pluralized and numerated as the nouns of physical objects like water flour wood metal “such terms as summer, winter, September morning, noon, sunset (...) are pluralized and numerated like nouns of physical objects (...) our thought about the referents of such words hence becomes objectified” (Whorf, 1956, p. 142).

*Simple temporal forms of verbs

In SAE the tense system governs the conceptualization and perception of time. This system was understood as larger scheme in which the subjective experience was systematically objectified (Whorf, 1956, p. 143).

This objectification makes us conceive events and actions in terms of things happening in space sequence as a unit ‘Imagination of time as like a row harmonizes with a system of three tenses’ (Whorf, 1956, p. 143). Whorf makes an analysis of the three tenses and what they reveal about consciousness. He states that in consciousness there is no past, present, future,” (...) but a unity embracing complexity “(Whorf, 1956, p. 143). However, Whorf asserts that we can construct and contemplate in thought a system of past, present, future. According to Whorf in conscious state we can distinguish two features: sensuous and non-sensuous. Sensuous is what we are hearing, seeing and touching. We may label it ‘the present’, whereas non-sensuous, the realm imagination and memory, is being labelled ‘the past’ and the realm of intuition, beliefs, and also uncertainty is ‘the future’

In Hopi language, verbs are not controlled by tenses but they have validity forms (assertions), aspects, and clause-linkage forms (modes). This latter is the most significant as the” (...) modes denotes relation between the clauses, including relations of later to earlier” (Whorf, 1956, p. 145). In validity, we distinguish whether an action is completed or ongoing, expected or regular and predictable. In Aspect we mean the length of time an event lasts, for clause-linkage giving the temporal relationship of two or more verbs.

c) Concept of space and matter

In SAE language according to Whorf, we distinguish two main kinds of nouns which denote physical objects, individual nouns and mass nouns. The first denotes bodies with boundaries like tree, a stick, a man, a hill while in mass noun denotes

“(...) homogenous continua without implied boundaries” (Whorf, 1956, p. 140) like water, flour, oil, meat, sand. Whorf distinguishes features of this distinction:

-The distinction marked by linguistic form “mass noun Lack plurals” (Whorf, 1956, p. 140).

-The distinction is at language level not in the observable appearance “more widely spread in language than in the observable appearance of things “(Whorf, 1956, p. 140).

-The distinction is somewhat forced by particular linguistic pattern on our description of both events and things.

What is meant by linguistic pattern is the individualization of mass noun by using container formula. This container has structure which is individual noun plus a similar relator like of in English: water is mass noun when we individualize we say glass of water. Glass (individualized noun), of (relator), water (mass noun). The relator has function either to denote the content of obvious cases like in example: cup of tea or to suggest contents in the obvious cases example chunk of wood.

Whorf sums up that conceptualization and analysis of space is done as set of concrete things, limited by their size, shapes and containers.

Hopi language has its own class of nouns possess plural/singular and individual sense. No mass nouns. Noun of water are still indefinite, but do not imply lack outline or size “our mass nouns still refer to vague bodies or vaguely bounded extents. They imply indefiniteness, but not lack, of outline and size” (Whorf, 1956, p. 141). Thus, they do not have to think of objects as a medium of formless items and forms. Nouns in Hopi are not individualized by either type-bodies or container, the noun itself is a container example not a glass of water, but ‘a water’ in other sense the description of object doesn’t focus on the physical traits such as shape or its location in certain container this entails that the physical limitations of things do not play a significant role in Hopi ‘s perception of space. They see space as a bigger whole, not as set of concrete things.

II The Main Critics to Whorf ‘s Principle

Whorf principle is the view that the world has more than one true description. Whorf presents

two main tenets: the first holds that differences in a language explicit a difference in the way one perceives and behaves in the world. The second holds that language varies in some aspects to create the difference in world view. Many have disputed the first claim which is about language and thought relation. Noam Chomsky notably argued against it in the preface to Adam Schaff 's Language and Cognition.

1. Noam Chomsky Criticism

1- Chomsky states that “The hypothesis of linguistic relativity as formulated particularly by Whorf, discussed here at length, is one that has given rise to much interesting thought and speculation” (Chomsky, 1973).

2-Chomsky and Schaff (1973) charged Whorf with not providing enough evidence to support his language determining effect on world view. They proclaim more research to be done.

3- “Whorf argues that the structure of language plays a role in determining a world-view characteristics of speakers of SAE with that of speakers of various American Indian Language. As Schaff notes the hypothesis practically rests on the treatment of the categories of time and space in Hopi” (Chomsky, 1973). Chomsky agrees with Schaff 's argument that Whorf is begging the question It means that Whorf started with results as the premise of his principle.

4-Chomsky argues that Whorf misrepresented the structure basis of SAE languages. He wrote “In English for example, there is no structural basis for the past –present-future world view that Whorf attributes, quite correctly, to SAE speaker” (Chomsky, 1973). He wrote also “there is (...), a much more fundamental defect in Whorf argument, namely that his description of SAE is incorrect...” (Chomsky, 1973). According to Chomsky the formal analysis of the English language demonstrates the distinction between past and present, set of aspects.

2. Response to Chomsky from Dan Moon hawk Alford

Chomsky uses the terms hypothesis of linguistic relativity, incorrectly Benjamin did not formulate any hypothesis. However, he formulated the principle.

Every concept has a relevant place in the terminology of scientific system, which is the main interest of Whorf.

Chomsky in his second criticism did not define the word determining means for him. For Whorf linguistic determinism is his second claim of linguistic principle. Its validity is strongly supported by the premise of linguistic differences. In the first sentence “Whorf argues that the structure of language plays a role in determining a world...” indicates that Chomsky understands the Whorfian concept through the autonomous syntax position. Therefore, one can question if the criticism is adequate since the understanding is based on framework changes.

Chomsky claims that Whorf lacks structural evidence for his claim. It is obvious that the problem disappears when one changes the framing, from the autonomous syntax to an anthropological approach. When the linguistic structure of Hopi and SAE are included into their cultural differences. Another possibility, if the frame work which remains the same, we could spot the direct differences in the linguistic structure such as temporal verbs three tenses in SAE, plurality and numeration impact the process of subjectifying (Hopi) and objectifying (SAE)spatial and time relations.

In the last criticism, it is difficult to know if Chomsky means that Whorf description of tense or time in SAE is incorrect, or the entire description of SAE. As if he meant to leave the question open. When he said “In English, for example...” what kind of example, is it a relevant one? Chomsky ‘s argumentation is very doubtful and complex. His understanding is not as precise as it should be. Whorf in his arguments never used English as typical for SAE group.

3. Steven Pinker Criticism

Steven Pinker in his book 'language instinct' chapter Mentalese, he asserts that words must be built upon concepts, not vice versa. In this chapter we notice how much Pinker holds against Whorf 'ideas he claims that Whorf hypothesis and predictions are "wrong, all wrong" (Pinker, 1995, p. 57) and that "the idea that thought is the same thing as language ...a conventional absurdity" (Pinker, 1995, p. 57). He concludes that Whorf was so subjective and illogical. Pinker's criticisms are as follows:

1- Pinker defines Whorfian hypothesis as having the weak and strong version. For the stronger version linguistic determinism, he states that people's thoughts are determined by categories made available by their language" (Pinker, 1995, p. 57). For the weaker version, the Whorfian hypothesis known as linguistic relativity Pinker defines it as "stating that differences in the thoughts of their speaker" (Pinker, 1995, p. 57).

2- Pinker goes far beyond this and suggests that the implication is heavy: the foundational categories of reality are not in the world but are imposed by one 's culture' (Pinker, 1995, p. 57).

3- Pinker describes Whorf 's evidence as either wrong or hoaxes. Pinker refutes Whorf's claims that Hopi language has "no words, grammatical forms, constructions, or expressions that refer directly to what we call 'time'" (Pinker, 1995, p. 57).

4- Pinker interprets when Whorf claims how Hopi uses time and tense differently by claiming on the former using example of native Hopi speaker uses a temporal descriptor: "the following day, quite early in the morning at the hour when people pray to the sun, around that time then he woke up the girl again" (Pinker, 1995, p. 63).

5- Pinker gave a list of examples from Amerindian supposing that Whorf uses them and criticizes them into two accounts. Pinker asserts that these three sentences were from Apache language. Pinker kept these sentences and criticizes them heavily “clumsy, word-for-translations, designed to make the literal meanings seem as odd as possible” (Pinker, 1995, p. 61).

4. Replay to Pinker criticism

For the first criticism Whorf never suggests that in his much quoted book of collecting essays language thought and reality. In fact, Whorf defines “grammatical patterns as interpretations of experience” (Whorf, 1956, p. 137).

The second criticism Whorf realizes that it was not the case and wrote that “there are connections but not correlation or diagnostic correspondences between cultural norms and linguistic patterns” (Whorf, 1956, p. 159). He advocates connections, not a correlation and certainly not a causality relation.

Reply to the third criticism: Whorf did not mean time in general, but concept of time. He actually wrote whole chapter explaining the non-linear properties of how Hopi perceps the concept of time. Their aspectual and modal marker system obliged them to refer to events without the use of time elements or tense markers. He never says that Hopi is incapable to understand what time is. He states that Hopi are different to us in time perception and the use of tenses.

In the fourth criticism: Pinker proved that he did not read the work of Whorf as it should be before offering such criticisms. If he did, he would notice that Whorf knew this. Whorf in an analysis of the Hopi grammar, wrote that “Hopi however all phrase terms, like summer, morning, etc, are not nouns but a kind of adverbs” (Whorf, 1956, p. 143). Pinker thinks that he

has countered Whorf, but in fact he has just reproduced what has been written over 40 years. It is kind of confirmation of what Whorf said by Pinker.

5-In Whorf 'writings he never studied Apache or had a true Apache informant. The sentences that Pinker count on them in his criticism to Whorf are not Apache sentences. The first two examples (boat and feast example) are from Nootka indigenous language spoken in Vancouver Islands (Whorf, 1956, pp. 236-243). The third example (gun example) is in Shawnee (Whorf, 1956, p. 208).

These are the language that Whorf studied. Whorf uses these sentences not to show examples of Amerindian thought, but he was attempting to show aspects of language in each example. For instance, 'in the boat is grounded on the beach 'the Nootka version is 'It is on the beach pointwise as an event of canoe motion' (Whorf, 1956, p. 236).Whorf tries to demonstrate that Nootka does not use nouns ,but rather verbs to express all events .He uses canoe motion which implies boat .For the second example, 'he invites people to a feast' in Nootka version 'somebody invites eaters of cooked food' (Whorf, 1956, p. 243).Whorf demonstrates that in Nootka sentences cannot be divided in terms of subject and predicates ,or actor and object.

III Supporting Researches to Whorf 's Principle

Whorf 'principle remains a hot topic in current research, particularly the relation between language and cognition is the one which fascinated many linguists. This section will review some of researches that have been tackled and results which have been come out relating to linguistic relativity. Many of the linguists who spend their time researching in this area were known as Neo- Whorfianists².

²Neo-Whorfianism term coined by Stephen C. Levinson to describe the re-examination of Whorfian view.

1. Dan Issac Slobin

Slobin is a psychologist. His specialty is cognitive and developmental psycholinguistics. He proposed that in the area of language and thought these terms should be replaced with thinking and speaking. Thus, he states the notion of thinking for speaking. He claims that any change in words is just to bring attention to the “mental processes that occur during the act of formulating an utterance” (Slobin, 1996, p. 71). He believes that there is kind of thinking that occurs in relation to thought “namely, the thinking that is carried out, on-line, in the process of speaking” (Slobin, 1996, p. 75). It also “involves picking those characteristics of objects and events that (a) fit some conceptualization of the event, and (b) are readily encodable in the language” (Slobin, 1996, p. 76). According to McNeil and Duncan (1998) Slobin ideas are related to linguistic relativity of Benjamin Lee.

“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 ...the elements most resistant to change being possibly those most deeply ingrained in thought.” (McNeil&Duncan, 1998).

2. John Lucy

Lucy well known Neo-Whorfianist. He studied Yucatec Maya; non plural marking language. It is indigenous Mayan Language of south-eastern Mexico for long period and American English. (LUCY, 2004). His intensive studies and researches were built on the structural differences between two languages and attempting to see if these differences can account for any cognitive changes in their speakers. He states that:

“...builds on analyses of multiple morph syntactic 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, p. 7).

Lucy focuses in his experiments on the treatment of nominal number marking patterns in both languages. He states that both languages are distinct in noun pluralization. In English nouns are pluralized when they are ‘semantically marked as referring to discrete objects ‘e.g. house, whereas nouns in which refer to objects without distinct shape e.g. oil, gasoline do not signal plural. On the other hand, Yucatec Maya has continuous pattern. In other sense, speakers are not obliged to signal plural for any particular referent, however, Lucy marked that Maya speaker signal plurality “often do mark it for animate referent” (LUCY, 2004, p. 7). He also studied how they numerate nouns. In English some plurality, numerals which are used with nouns which have been marked as having a semantically discrete reference (LUCY, 2004) modify noun itself e.g. one dish /two dishes. In Yucatec Maya has a continuous pattern all constructions with numerals must have a special form with it, they are known as numerals classifiers “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, p. 8). Lucy said that these forms typically provide information about the shape or material properties of the object e.g. (un-tz’iit kib) which means one long thin candle (LUCY, 2004, p. 8). He points out that word kib close translation is wax not candle. If it is without numeral modifier it can refer to what we call candle. That’s why he explains the necessity of using a unit like a classifier. Lucy concludes that English requires unitizing construction for some nouns, but in Yucatec it is recommended for all nouns (LUCY, 2004, p. 8). 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 that language influences thought.

“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... we can say we have evidence that language structures bear some relationship to thought” (LUCY, 2004, p. 18_19).

3. Lera Boroditsky

Lera is a professor in psychology at Stanford University. The area of research is cognitive science, particularly language and cognition, and the interactions between language, cognition and perception. She has many articles on this issue and the area of linguistic relativity.

In her papers related to linguistic relativity, she refers to the obvious differences amongst languages: vocabulary, pronunciation and indeed grammar (Boroditsky, (2003a)). She describes how if a single sentence was repeated in several languages, each language would have its specific way of representing the sentence; focus on different aspect of it. For instance, her example The elephant ate the peanuts. In English we must use tense to show when the event took place, whereas in Mandarin and Indonesian using tense would be optional and it would be implied separately to the verb. In Russia, same as English, would require tense but if it is past it would require other information whether it is female or male is eating/ all peanuts or just some. The same situation in French language. In Turkish, they need confirmation if the event of eating peanuts happened or just hear say; this would be shown as a suffix on the verb (Boroditsky, (2003a), p. 917). She states that these differences may have some influence on cognition Her research provides us with “several lines of evidence regarding the effects of

language on people's representations of space, time substances and objects" (Boroditsky, 2001, p. 1).

*Concept of Space

Boroditsky and her colleagues in MIT tests Whorf principle on the grounds of particular languages. Her starting point is the analysis of how language influences the concept of space." Languages differ considerably in how they describe spatial relations" (Boroditsky, 2001). For example, English and Dutch both distinguish between putting things into containers and onto surfaces" (Boroditsky Lera 2003a, p. 918). Example in English, we would say 'she put the key in the lock' and she put key on the table. Korean, however distinguish between "tight and loose fit or attachment" (Boroditsky L., 2003a, p. 918).

So if we take the previous example and compare it to 'she put trouser in the basket'; in Korean we need to use the term **nehta** to refer to loose containment proposed by putting the trousers in the basket and term **kitta** to refer to the tight fit of putting key in the lock. This difference in spatial relations was tested by

Lorain McDonough (2000) to see whether there is an implication of linguistic relativity. They discovered that paralinguistic 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 (Boroditsky L., 2003a).

The distinction between languages have also been noted in relation to spatial locations (Levinson quoted in Boroditsky 2003. P,918) languages such as English and Dutch use terms such as left/right, front back to refer to spatial locations, in Tzeltal Maya language focuses on absolute reference, similar to the use of north, south etc. In English north referring to downhill and south referring to uphill. No equivalence in Tzeltal for English terms. Levinson carried out a test to see if there is a relationship between these differences and cognition. He found that: "Tzeltal

speakers 'heavy relevance on absolute reference in spatial description appears to have affected their interpretation of (and performance on) a non-linguistic orientation task' (Boroditsky L., 2003a, p. 918). Boroditsky asserts from these tests and observance, that language indeed constraint speaker's spatial thinking.

*Concept of Time

There are also differences in languages in their representation of time. Spatial terms such as forward, ahead are used in all languages to refer to time, but different languages have different spatial terms (Boroditsky L., 2003a, p. 919). In English we use horizontal terms to talk about language such as front /back example 'the best is ahead of us / the worst is behind us'. In Mandarin speakers use horizontal too, but it also has a vertical representation of time using terms such as up /down e.g. 'the next month' 'down month', 'last month' 'the up month'. Boroditsky carried out experiment based on time representation differences between English and Mandarin on native speakers of each language. The results are like this:

"answered purely temporal questions faster after horizontal primes than vertical primes...."

When answering questions phrased in purely temporal early/late terms, Mandarin speakers were faster after vertical primes than after horizontal primes" (Boroditsky, 2001, p. 10).

Lera and other colleagues rephrase question how do we know that is language itself that creates these differences in thought and not some other aspects? they found that the solution is to teach new ways of thinking and see that changes the way they think. In MIT laboratory they have taught English speakers different ways of talking about time: one way uses of size metaphors as Greek describe duration e.g. play is longer than series. When English speakers learn how to talk their cognitive performance began to resemble that of Greek mandarin speakers. This make Boroditsky and her colleagues suggest that patterns in language indeed play

a causal role in constructing how we think. In other sense, when you learn a new language, you are learning new way of thinking.

*Shapes and substances: Boroditsky tackles the differences in the grammatical distinction between objects and substances Lucy and Gaskin undertaken experiment, Boroditsky took this experiment and discussed its results. She states that the findings of Lucy and Gaskin point to the how these aspects of grammar could shape a speaker conceptualization of the shapes and materials of objects (Boroditsky L., 2003a, pp. 919-920).

*Objects: many languages have grammatical gender system when all nouns are assigned to a certain gender words belong to different genders get treated differently grammatically and vice versa. Gender requires the speaker to change the pronoun, adverb, adjective, verb ending...etc., depending on noun's gender for example, my chair was old in Russian 'moy stul bil stariy', you need to make every word in sentence agree with gender of chair (stul)which is masculine in Russian. Lera Boroditsky made a study, she asked German and Spanish to describe objects having opposite gender in both languages.

For instance, she asked speakers to describe word key masculine in German and feminine in Spanish. German: key hard, heavy, metal. Spanish key is golden, lovely, little. Although the test was in English language; genderless language, but results show that the pattern of native language control thinking. Boroditsky asserts this remark by example of personification in art gallery. The way abstract entities such as victory, death, sin or time are given human form. How an artist decides to paint death as male or female? It turns out 85% personification whether male or female figure is predicted by grammatical gender of the word in the artists' native language. In German painters tend to paint death as man, whereas in Russia painters are liked to paint death as a woman.

Conclusion

In this chapter, I have focused on proving that the linguistic principle which demonstrates relativistic approach to time perception and to what actually denotes is, defensible against claims made by the universalist Noam Chomsky and Steven Pinker.

Chomsky and Pinker criticisms lack evidences; they are just speculations based on unsure understanding. Both scientists proved how much they lack closeness to Whorf 'works. John Lucy, Boroditsky Lera, Dan Slobin show how much linguistic principle influences contemporary researches on the connection language behavior and on cognition. From researches presented the investigation concludes that it can be claimed with certainty that Natural Language does influence conscious thought.

Chapter Three:

Methodology

and

Practical Issues

Introduction

This chapter is devoted to the practical side of the research. It starts by considering the research questions, then moves on to the explanation of the design of the experiment used in this study (voice attribution task and SVO -VSO experiment) by giving full description to the stimuli and the criteria for selecting them. This chapter continues to describe the methodology and plan for the study as well as the design stages for the experiments. It also gives details about the population studied in all tasks. Finally, this chapter comprises a general discussion of the findings of the two experiments in relation to previous researches.

I Research Questions

The literary review in the previous chapters insisted on further research to validate or decline the linguistic relativity of Whorf and Sapir. In other sense, to answer the question on how language can affect our cognition in general and specifically how native language can alter our thinking. Investigating bilingualism was the center point to answer that question. As a result, the following research questions were proposed:

The Main question: Do native languages influence cognition?

- Are bilingualism task of objects 'categorization distinct from each other? Does this distinction have relation to the native language?

- Does the gender of the mother tongue have an impact on the object categorization?

- Do the syntactic differences affect cognition?

II Hypotheses

We assume that speakers of French and Arabic language will differ significantly in their voice assignment to pictures of inanimate objects. The distinction has high percentage relation their mother tongue. Arabic speakers as well as French speakers will assign voices to objects according to the grammatical gender of their native language.

This study is aimed at investigating the possible effects of Arabic grammatical gender on the cognition of Arabic bilingual speakers, French speakers were taken for study improvement. Furthermore, it investigates the performance of Arabic-French bilinguals to find out whether they differ from their bilingual counterparts and whether they change any cognitive aspect as a consequence of learning English. The investigation uses different cognitive experiments and this section describes the process of the experiments.

III Research Methodology

IV.1. Experiment 1: Voice Attribution Task

A. Participants: Thirty-three native speakers of Arabic took part in this study (20 men ,13women; range=20-27 years, mean age =28.55) and thirty-three native French speakers also participated in this study (16women,17 men; range = 21-25, mean age =22.69). All the participants were either undergraduates (26) or postgraduates at the University of Mostaganem. Participants were tested individually in quiet places to avoid any effect of extraneous factors such as noise. Some were tested in the library, some in campus. All participant of both groups (Arab-French) have normal and correct vision, they voluntarily participated in this study except 5 French participants I paid for their participation.

B. Materials

Participants were shown 31 pictures of objects we use in our daily life which include two types of trials, four control trial and 29 filler trials (see Appndix A). The four control trials consist of two males (father, soldier) and two females (bride, grand mom). The purpose of control trials to make that participants had understood the task very well. The participants should assign voices to the natural gender (male/female). For instance, grand mom should be assigned to female voice by all participants. The following filler trials were conducted to reveal the influence of grammatical gender on the voice attribution of Arabic participants. The 27 pictures of objects are divided between 9 artificial objects (8 masculine and 10 feminine) in Arabic natural object (1feminine and 7 masculine) (see table3.1).

Control trials		Filler trials			
Female	Male	Masculine		Feminine	
		Natural	Artificial	Natural	Artificial
Bride	Father	Liver	Bathroom	Orange	Pillow
Grand mom	soldier		Flag	Cloud	Window
			Chair	Palm	Traffic_light
			Blanket	Flower	Basket
			Bark	Galaxy	Ball
			Key	Sun	Ring
			Tram	Teeth	Spoon
			Pen	doll	Boat
					Skirt

Table3.1 List of Trial Items

All the objects' pictures are black and white drawings with the same size (200×200 pixel; 5×5cm) to avoid the occurrence of variable effects such as color, size ...etc. The items were presented on computer using psychological tool Super lab. Each picture was presented for seconds. The order was randomized to avoid any repetition of answer.

C. Procedure

For this experiment I have used randomized block design. The timing of the task was around 25minutes. The participants were tested individually. Before starting the task, participants have been informed by the instruction of this task; assigning male or female voice for appropriate

picture on this device by clicking on Y for male voice and G for female voice. The instructions were given in their native language (French –Arabic). In this task I avoid using words such as gender, masculine and feminine in the instruction in order to keep participants away from research purpose. Also to guarantee the objectivity of the task. The participants were informed that the categorization has no relation with intelligence, no right or wrong answers. It is matter matter of opinion. At the end, the participants have an idea about their right to ask the experimenter to stop the task whenever they get bored or in need for more clarification about task.

Nous réalisons une petite vidéo présentant quelques objets du quotidien. Vous verrez une série d'images de ces objets et devrez déterminer si chaque objet doit avoir une voix d'homme ou une voix de femme. Si vous décidez qu'un objet devrait avoir une voix femell, veuillez cliquer sur la lettre "G" du clavier. Si vous décidez qu'il doit avoir une voix male, cliquez sur "Y". Vous verrez l'image pendant 7 secondes, elle sera suivie d'un blanc pendant 3 secondes, puis un. Appuyez sur la barre d'espace pour lancer l'expérience.

نحن بصدد انشاء فيديو صغير يعرض بعض

الصور الأشياء يومية. سترى سلسلة من الصور لهذه الأشياء وتحتاج التحدي ما إذا كان يجب ان يكون لكل عنصر صوت رجل أو امرأة. اذا قررت ان الصورة تطابق صوت مرأة يرجى النقر على الحرف Y في لوحة المفاتيح، واذا كان الاختيار صوت ذكر، فإنقر فوق الحرف G. كل صورة تعرض لمدة 7 ثواني بين كل صورة فراغ لمدة 3 ثاني. الضغط على شريط المسافة لبدء التجربة

1. Experimental hypothesis :Before starting the experiment ,we need to formulate two hypotheses

Null Hypothesis(H_0): When a group of native Arab speakers and native French speakers are asked to depict the appropriate voice stimuli, their responses will reflect on what their thinking of selecting the voice assignment is based on random performances of participants. Hence, there is no impact of native language on the object categorization.

*Alternative hypothesis(H_1): the hypothesis that will reject (H_1). The objects' categorization is due to the impact of grammatical gender of native language.

We have two conditions and two variables in this experiment:

*Independent variable in this study is gender of the native language. Here we have two levels; French gender and Arabic gender.

*Dependent variable is the task of voice attribution to object categorization

The Experimental condition: in this study we have two conditions.

*Condition1: The pictures were presented to a group of Arab speakers.

*Condition 2: The same pictures were presented to a group of French speakers.

2. Rational for the study:

The aim of this task is to find out if there are significant differences in the subject's results under the two groups. The expectation is to find equality between the participants' selection of voices and the grammatical gender of the objects in their mother tongue.

IV Results :

The percentage of the voice assignment was calculated to each picture was calculated. The table below illustrates the mean percentage of voice assignment task for the control trials and filler trials. The results of the control trials were similar in both subjects 'groups (Arab vs French). The mean percentage of voice attribution and standard deviation explain that participants assign a voice in accordance with the grammatical gender of their native language.

	FILLER	CONTROL	F	P
French speakers	M=16.62 SD=6.685	100.0	31.85	0.003
Arab speakers	M=22.105 SD=15.225	100.0		

Table 3.2: The percentage of voice assignment in Arab groups and French group

The subjects of both groups assigned voices to the control trials in accordance with the grammatical gender and nature of the object presented in the picture. The highest percentage and shorter time of response entails that participants understood the task as their categorization for the filler trials. I have used ANOVA (Analysis of the variance) in order to examine how many times did the subjects attribute correct voice (male or female) to the right picture in

relation to their native languages grammar gender. The reason behind using ANOVA, the two groups split on two independent variables. This test is used to examine whether there is an interaction between independent variable on the dependent variables. The table below provides us with detailed results of the mean and standard deviation of voice attribution for filler trials by the Arabic participants and French.

Language groups	Mean		SD	
	Male voice	Female voice	Male voice	Female voice
Arabic speakers	29.61	13.25	15.89	8.75
French speakers	21.33	11.88	5.659	2.223

Table3.3: Voice assignment of filler trials categorization in relation to grammatical gender of native language

In this table we can see that both participants of groups made high response to the same voice attribution rather than other voice. Male voice in Arab group (m=29.61) and in French group(m=21.33) There is slight differences between the two results which prove how much the participants share degree of object categorization. In Two Way ANOVA [F (1.36), P (0.006)>0.05] participants' assignment of voice was compatible to grammatical gender of their native language. The P Value in ANOVA table proves the significance of this study; according to statistics laws small P indicates strong evidence against the null hypothesis. Therefore, we reject the null hypothesis and accept the alternative one. The result confirms that our native language influence object categorization, this latter is an aspect of cognition. So, we can conclude that native language alters our cognition. For further evidences to what we have proved. I have conducted another test before definitive rejecting of null hypothesis. Although

the results obtained from ANOVA showed significant effect of native language and gender. I wanted to make sure that these results are not obtained due chance. I made another

$$d = \frac{M_E - M_C}{\text{Sample } SD \text{ pooled}} \times \left(\frac{N-3}{N-2.25} \right) \times \sqrt{\frac{N-2}{N}}$$

correction factor for
small samples <50

$$M_E - M_C = 11.888 - 21.333 =$$

$$SD_{pooled} = \sqrt{\frac{(SD_1^2 + SD_2^2)}{2}}$$

$$SD_1^2 = (6.685)^2$$

$$SD_2^2 = (15.22)^2$$

$$N=33$$

Cohen's of 2.60 represents the larger effect size difference between two groups of participants. This effect size entails the valid difference of voice assignment by the subjects and the strength of the phenomena.

Both tests (significance value and Cohen's D) are the power of any accurate results and experiment design.

V Discussion

The results reveals that both participants (Arab –French) tended to classify the voice assignment to objects based on the categorization of grammatical gender in their mother tongue.

Therefore, these findings suggest that while the subjects performed the task, their perception to objects' genders is influenced by the grammatical genders assigned to those objects. Since the extraneous factors are excluded, we can conclude that native language can significantly affect the cognition of speakers of a language. This what Cohen's D test proved with the P value method

IV.2. Experiment 2: The syntactic structure SVO – VSO

The main focus of this experiment is the syntactic structure differences between Arabic and French. French language is SVO (subject-verb-object) whereas Arabic language is VSO(verb-subject-object) i.e. the verb comes first in the sentence, followed by the subject that it refers to e.g. Tadrose Hayat aleulum (Hayat studies science). In order to figure out if these syntactic differences would display differences in cognition of speakers, the experiment was conducted between French and Arab speakers.

I Methodology

A. Participants: Thirty-two native Arab-speaking students at the University of Mostaganem (15 men, 28 women; mean age 25.75 years, range: 20–34 years) and 33 native French-speaking students at the University of Mostaganem (20 women,13men; mean age 23.76 years, range: 21–28 years) voluntarily participated in the experiment; they all had normal or corrected-to-normal vision.

B. Procedure

The participants were presented with 9 pictures which depicts particular action (see Appendix B). The experiment was set up on a computer using PowerPoint. The participants

were asked to choose between two choices that illustrates best description to the picture e.g. If the picture was of a woman dancing, the participants should select between woman or dancing each picture was presented for 5 seconds. The way the pictures were presented on Power Point was at random. My intention is to prevent participants from picking the same option each time. Another step was taken into consideration while conducting this study to avoid any bias Participant were asked to answer some question concerning proficiency of language (demographic questions).

B. Aim of the experiment

The experiment tends to see if the Arab participants will reflect to their syntactic structure by choosing the action over the subject, and French participants choose subject over action.

D. Results

After collecting data, the results look inaccurate regarding to the choice between subject and action. The results show that French participants select action over subject ten times and Arabs chooses subject 13 times over action (see table 3.4). These result seems against the syntactic structure of the mother language. Therefore, statistical analysis required to be conducted to test the accuracy of these results. The parametric unrelated T-test would appear suitable in our study. It is test which enable us to examine different subjects under two conditions.

Arab Participants	Action Choice	Subject Choice	French Participants	Action Choice2	Subject Choice3
participant1	4	5	participant1	0	9
participant2	1	8	participant2	7	2
participant3	2	7	participant3	2	7
participant4	8	6	participant4	3	6
participant5	3	1	participant5	0	9
participant6	3	6	participant6	1	8
participant7	8	1	participant7	3	6
participant8	7	4	participant8	9	0
participant9	9	0	participant9	5	4
participant10	7	2	participant10	2	7
participant11	8	1	participant11	1	8
participant12	8	9	participant12	2	7
participant13	9	0	participant13	1	8
participant14	8	1	participant14	3	6
participant15	6	3	participant15	7	2
participant16	2	7	participant16	8	1
participant17	4	5	participant17	3	6
participant18	6	3	participant18	4	5
participant19	0	9	participant19	5	4
participant20	4	5	participant20	8	1
participant21	7	2	participant21	7	2
participant22	8	1	participant22	1	8
participant23	7	2	participant23	6	3
participant24	8	1	participant24	6	3
participant25	5	4	participant25	1	8
participant26	2	7	participant26	2	7
participant27	1	8	participant27	0	9
participant28	6	3	participant28	2	7
participant29	5	4	participant29	1	8
participant30	3	6	participant30	1	8
participant31	7	2	participant31	3	6
participant32	5	4	participant32	1	8
participant33	9	0	participant33	2	7
	180	127		107	190
TOTAL	180	127		107	190
MEAN	5,454545455	3,735294118		3.2424242	5,757575758

Table3.4: Distinction of choices between Arab and French participants

E. Statistical analysis:

1. Experimental Hypothesis

*Null hypothesis: The choice of participants is due to random performances

*Independent variable: The differences in syntactic structure.

*Dependent variable: the task of choosing the best description for the picture (action or subject).

*Condition1: The pictures that are presented to group of Arab speakers.

*Condition 2: The same pictures are presented for a group of French speakers.

2. Expectation for this experiment:

Arab group will score highly in action rather than subject. French group will score high percentage in the subject choice than action.

*Rational for study: This test aims to find out if there are significant differences two conditions.

3. **T- test (unrelated) calculation** T –test as I mentioned earlier is a parametric test used when we have two conditions and one independent variable for different group of participants

$$t = \frac{M_X - M_Y}{\sqrt{\left[\frac{\left(\sum X^2 - \frac{(\sum X)^2}{N_X} \right) + \left(\sum Y^2 - \frac{(\sum Y)^2}{N_Y} \right)}{N_X + N_Y - 2} \right] \cdot \left[\frac{1}{N_X} + \frac{1}{N_Y} \right]}}$$

M_x mean of condition 1

M_y mean of condition 2

$\sum x^2$ Sum squares of condition 1

$\sum y^2$ Sum squares of condition 2

N_x Number of participants in Arab group

N_y Number of participants in French group

VI Discussion

After substituting the above result in table 3.5 to the T-test formula, we found that $t = 47.98$ looking for equivalent to it in T-test table $t(47.98) = 1.684$. 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: $Df = (n_1 - 1) + (n_2 - 1)$ df here in this study equal 64. Hence, $df(64) = 1.667$. In order for T- test to be significant we need to have a value of 1.667 or greater, thus our value of 1.684 is clearly significant. Thus we can see that in the test above there is significant difference in the choices made between Arab and French. In sum up, syntactic structure's differences between languages influence on the cognitive task of their speakers.

Experimental condition 1		Experimental condition 2	
SCORES X1	SCORES X1 ²	SCORES X2	SCORES X2 ²
4	16	0	0
1	1	7	49
2	4	2	4
8	64	3	9
3	9	0	0
3	9	1	1
8	81	3	9

7	49	9	81
9	81	5	25
7	49	2	4
8	64	1	1
8	64	2	4
9	81	1	1
8	64	3	9
6	36	7	49
2	4	8	64
4	16	3	9
6	36	4	16
0	0	5	25
4	16	8	64
7	49	7	49
8	64	1	1
7	49	6	36
8	64	6	36
8	64	6	36
5	25	1	1
2	4	2	2
1	1	0	0
6	36	2	4
5	25	1	1
3	9	1	1
7	49	3	9
5	25	1	1
9	81	2	4
TOTAL 180	Total =1225	Total=107	Total=569
MEAN =5,454545455	Mean =37,12121212	Mean =3,242424242	Mean =17,24242424

Table3.5: Required results for T-test 1

VII Assembling Results

In this title we attempt to answer each question of the study through the analysis above, starting first by the main question Do native languages influence cognition?

Through the experimental analysis relying on linguistic tool 'Linguistic relativism'. The results show that native language has an impact on the cognitive processes such as the grammatical categorization of objects in the first experiment which is one aspect of cognition. This conclusion built on significant and accurate data

The second question: Does the gender of the mother tongue have an impact on the object categorization? The results of the first experiment, the voice-attribution task, revealed that Arabic speakers were strongly affected by the gender system of their language when required to assign voices to pictures of inanimate objects same for French speakers who follow the same pattern. Arabic participants' voice assignments followed the Arabic grammatical gender classifications considerably more than would be expected by chance. Thus, the grammatical gender of native language does influence cognition.

The third question: Doe the syntactic differences affect cognition? According to T-test results from the study done on Arab speakers and French speaker. Their differences in structure create big difference between then in choosing task.

Conclusion

this chapter consists of the analysis of the native language has an effect on cognition. This done through conducting two experiments using linguistic relativity principle of Whorf as a linguistic tool. In both experiments the results supported our hypotheses. The present study investigated the influence of aspects of language that vary across different languages on the way people categorize inanimate entities. With the two experiments described earlier, we could demonstrate the existence of the effects of grammatical gender on people's object

categorization. In the second experiment, which examined the difference between syntactic patterns of French and Arabic native speakers, it was found that speakers in each group rely on their mother tongue syntactic structure to describe events. As a matter of fact, language influence cognition.

General Conclusion

The issue of interconnection between language and thought and the impact of language on thought arises several approaches. Most theorists, despite their disagreement on some points, all state that language involves in human thought and in the thinking process. Another point of view exists, according to Carruthers, Peter and Boucher Jill (1998, pp 1-18) language has a direct executive role in the thinking of individuals. Fodor (1975) disagrees, he states that if we assume that every predicate in natural language corresponds to a predicates in the internal code; mentalese 'it is quite conceivable that learning a natural language may increase the complexity of the thought that we can think '. Therefore, he accepts that articulate organism which is natural language may have advantage over an inarticulate one; mentalese. Moreover, he simply accepts the Whorfian point of view that 'the kinds of concepts one have may be profoundly determined by the character of the natural language that one speaks'. This view was strongly criticized as an exaggeration by many scholars. One of the representative are Jerry Fodor and Steven Pinker. These theorists postulate that natural language and thought are independent and much of our thinking is done by non-conscious innate mental language called mentalese.

This work demonstrates that natural language is language of thought, most of the phenomena that mentalese was addressed to are explained better by natural language. Thus, the relation between language and thought is completely intertwined. Natural language is introspectively accessible and able to be located in the brain of human using FMRI scan (Functional magnetic resonance imaging scan). These arguments support the cognitive role of natural language and open gap to many researchers to rise a hot question whether the Whorfian point of view 'language influences cognition 'true or trivial. In this account, this study investigates the issue to reveal that our thinking is done in natural language and this latter has an influence on our cognition. The response to these hypotheses lead us to conduct two cognitive experiments. The

study adopted qualitative approach as an effective approach for more conclusive and satisfactory results. Grammar and syntactic structure are used as an area of investigation. This work is not new but has a specificity. Previous researches were based on language and thought relation as universal. This study worked on native language and categorization as an aspect of cognition.

The main findings of both cognitive tasks (voice attribution task and (SVO-VSO) demonstrates that native language alters our participants' performance. The first experiment proves that the grammar gender of native language of our participants is the center part of their mental representations. In second experiments, participants result show that their performance was in accordance to their mother tongue syntactic structure.

The claim that language influences cognition which is known as linguistic relativity (Whorf 1956, Lucy 1992) is not trivial. The statistical analysis of both experiments prove that issue.

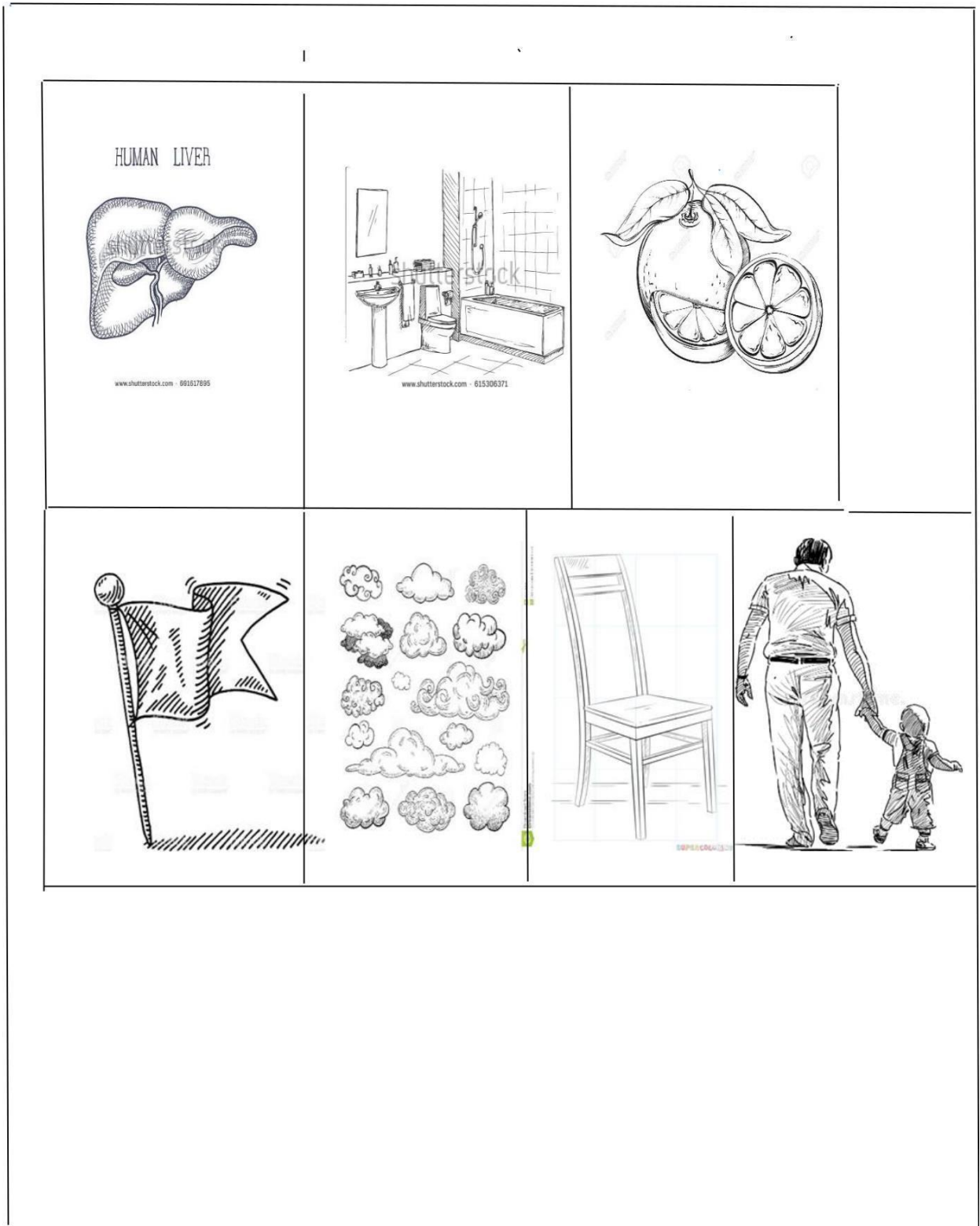
Limitations and Recommendations for Future Research

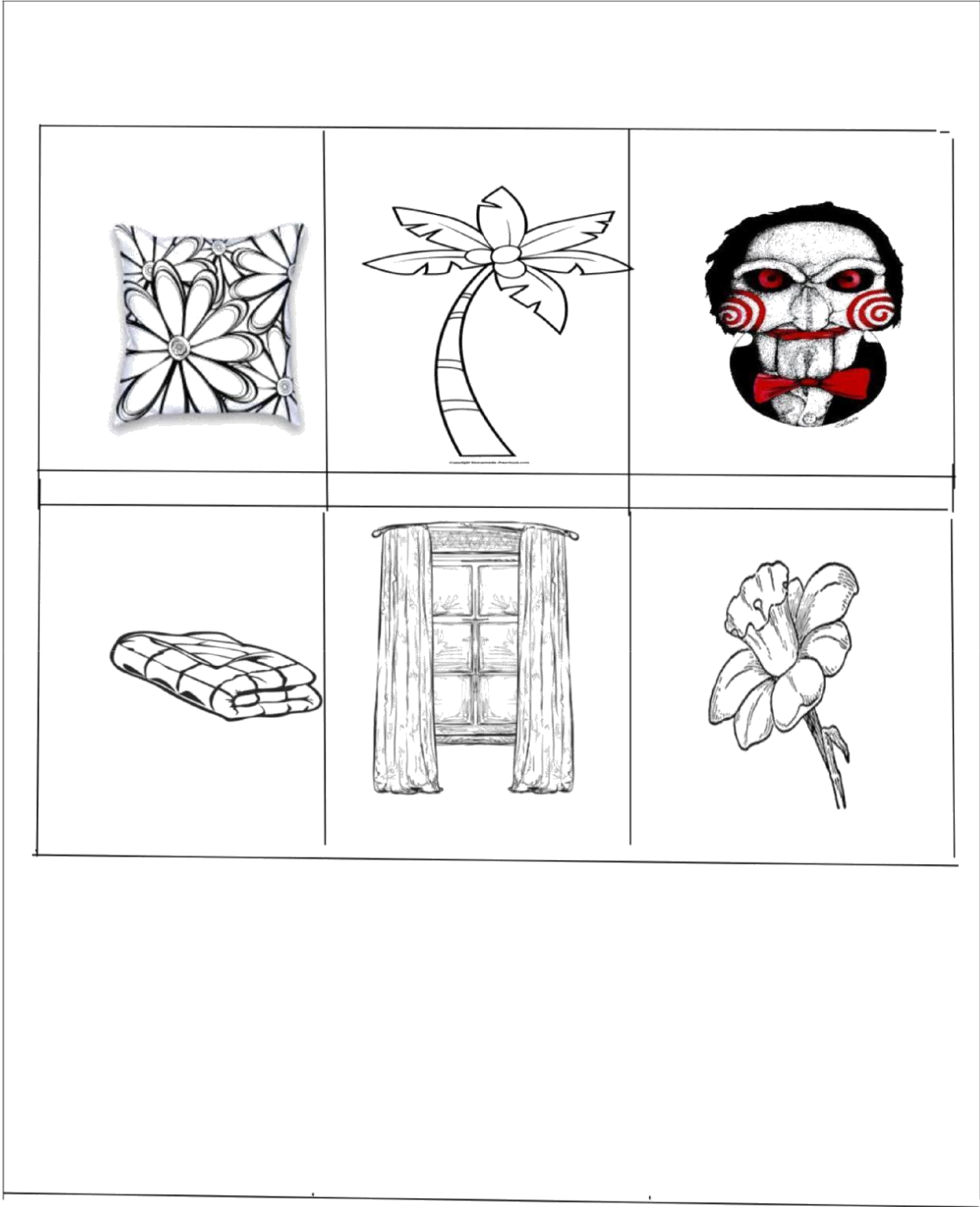
In this work we adopted experimental approach and the findings of such research may not be generalized to whole participants. Specifically, the study has certain limitation which should be addressed in future research. For instance, there are many varieties for Arabic language such as Tunisian, Egyptian etc , but this study focused on Algerian Arabic to answer the effect of language on cognition. So the current results are not so generalized to count all Arabic speakers.

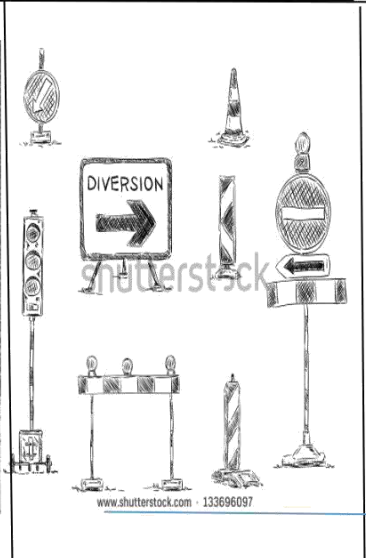
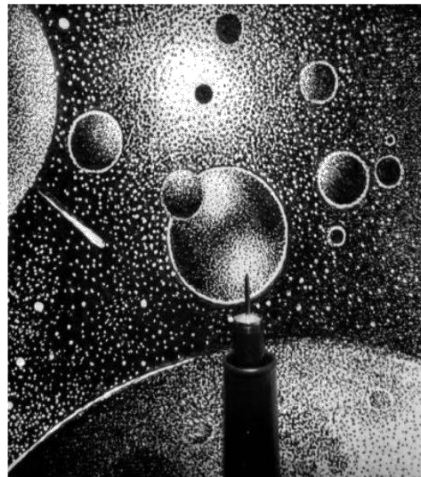
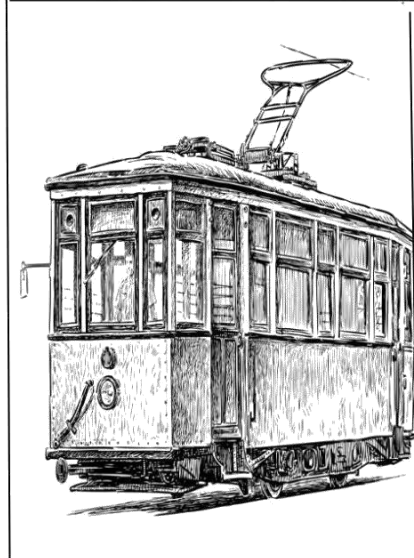
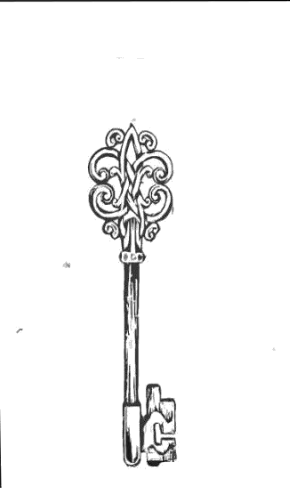
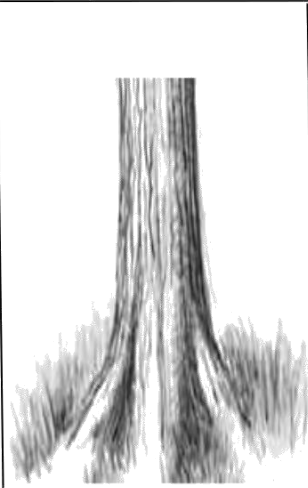
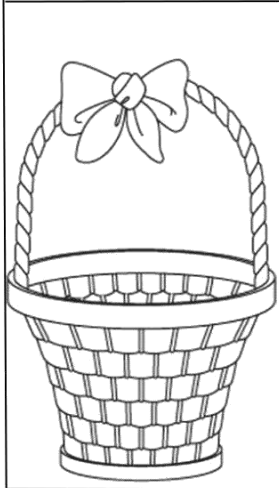
Another limitation, we have used only two experiments due to the type of the master degree the word- count is taken into consideration.

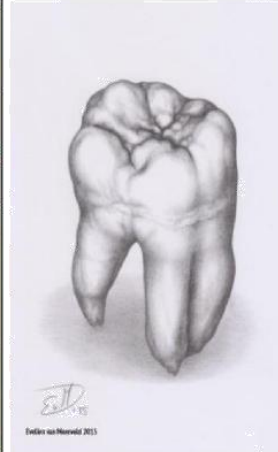
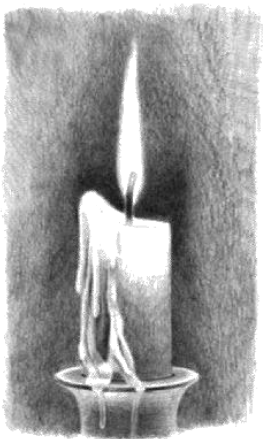
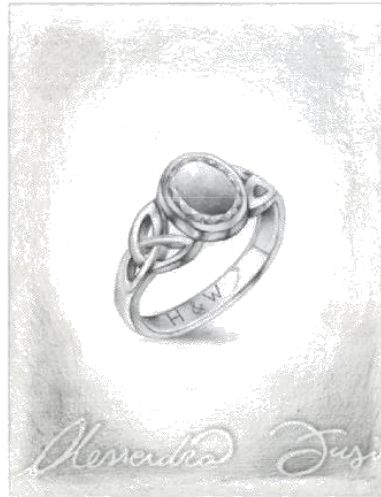
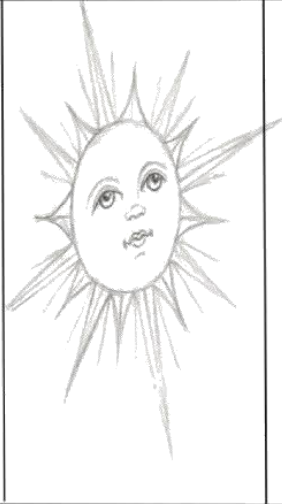
The study investigates only adults participants because of their complete first language acquisition and are able to understand and perform cognitive tasks. Future research could investigate other groups such as young adults or even children who could enhance our understanding about the issue.

APPENDIX A: Voice Attribution Task 'Items









APPENDIX A 1: Participants' Evaluation of Grammatical Gender of Trials

(English Version)

Trials	Grammatical Gender	
	Masculine	Feminine
Liver		
Bathroom		
Orange		
Flag		
Cloud		
Father		
Pillow		
Palm		
Doll		
Blanket		
Window		
Rose		
Basket		
Bark		
Key		
Bride		
Tram Way		
Galaxy		
Traffic Light		
Ball		
Sun		
Pen		
Soldier		
Boat		
Ring		
Spoon		
Candle		
Skirt		
Teeth		
Grand Mom		

APPENDIX A1: التصنيف النحوي للأسماء الأشياء المستعملة في التجربة

التصنيف النحوي للأسماء		الأسماء	
مذكر	المؤنث		
		كبد	1
		الحمام	2
		برتقالة	3
		العلم	4
		الغيمة	5
		كرسي	6
		الأب	7
		وسادة	8
		النخلة	9
		الدمية	10
		بطانية	11
		النافذة	12
		زهرة	13
		سلة	14
		لحاء	15
		مفتاح	16
		عروس	17
		ترام	18
		المجرة	19
		اشارة المرور	20
		كرة	21
		الشمس	22
		قلم	23
		جندي	24
		قارب	25
		خاتم	26
		ملعقة	27
		شمعة	28
		تنورة	29
		الأسنان	30
		العجوزة	31

Appendix A.3: Answer Sheet for Voice Attribution Experiment

(English version)

Should the pictures shown on the screen have the voice of a man or the voice of a woman? If you see that the object should have a female voice, please circle F in the column named "VOICE". If you decide that it should have a male voice, then circle M.

Version Française

Les images montrées sur l'écran devraient-elles avoir la voix d'un homme ou la voix d'une femme ? Si vous voyez que l'objet doit avoir une voix féminine, encerclez F dans la colonne "VOICE". Si vous décidez qu'il devrait avoir une voix masculine, encerclez M

Trial	Voice		Trial	Voice	
1	F	M	18	F	M
2	F	M	19	F	M
3	F	M	20	F	M
4	F	M	21	F	M
5	F	M	22	F	M
6	F	M	23	F	M
7	F	M	24	F	M
8	F	M	25	F	M
9	F	M	26	F	M
10	F	M	27	F	M
11	F	M	28	F	M

12	F	M	29	F	M
13	F	M	30	F	M
14	F	M	31	F	M
15	F	M	32	F	M
16	F	M	33	F	M
17	F	M	34	F	M

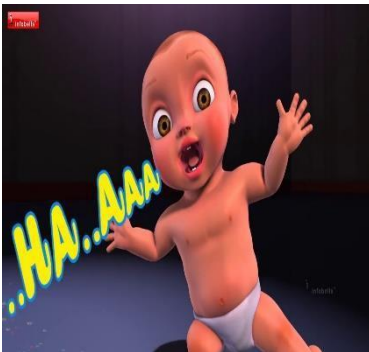
APPENDIX B



Foot Player Shooting



Woman Eating



Baby Laughing



Chimpanzee Shooting



Dog Running



Cat Sleeping



Fluting Boy



Diver Diving



Couple Chatting

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