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RELATION BETWEEN SEMANTICS OF LANGUAGES AND PREFERENCE OF LANGUAGE IN ATTENDED MESSAGE IN DICHOTIC LISTENING TASK

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Abstract

The task of Dichotic listening has been modified in numerous ways and has been used to study multiple cognitive auditory processes in various ways. A modification of Dichotic Listening Task was used to study if any relation exists between semantics of languages and preference of languages in attended message where the presented messages consisted of 6 passages of 3 languages, L1 (Marwari-Rajasthani), L2 (Hindi) and L3 (English) consisting of 10 lines each, presented at a speed of 150 words per minute. The sample consisted of stratified random sample of 120 college students, with their first language learned L1 being Marwari-Rajasthani, second language learned L2 being Hindi and third language learned L3 being English. The experiment was conducted in two sessions, with each language presented in each ear against other languages. After collection of data and performing statistical analysis, it was found that there existed no significant difference in choice of language between languages with similar sementics, which were L1 and L2. However, there existed significant difference in choice of language in attended message between languages of different semantics, which were L1 and L3, and L2 and L3.

Keywords: Dichotic-Listening-Task, Semantics, semantically-similar-languages, semantically-different-languages, First-language, attended-message, working-memory

Introduction

The elemental concept of understanding Dichotic listening processes are sensation and perception.

Sensation is related to one's initial introduction with surrounding environment. When an individual exists in environment, it is surrounded by various stimuli present around her. The relation between various stimuli laying claim on one's sensory stimulation (like sound, movement, or color) and which or how much the sense organs register and interpret is termed as perception.

In simple words, sensation is "inputs about the physical world provided by our sensory receptors" (Baron, 2013) and perception is "the process through which we select, organize and interpret input from our sensory receptors." (Baron, 2013)

All the information about any stimulus is received by the sense organs present on one's body, which are eyes for visual stimuli, ears for auditory stimuli, nose for olfactory stimuli or smell, tongue for taste and skin for tactile stimuli. The sense organs comprises of sensory receptors, which are specialized cells with the task of conversion of the physical energy into neural impulses. This process of conversion is *transduction.*

After this process, ".. intricate patterns of action potential conducted by *neurons*, special cells within our bodies that receive, move and process sensory information." (Baron, 2013). Thus this conversion leads to the information being

carried by neurons in the form of electrical impulses to the brain for interpretation. The process by which this interpretation is done is called *perception.*

Selective Attention

"The term *selective attention* refers to the fact that we usually focus our attention on one or a few tasks or events rather than on many. To say we mentally focus our resource implies that we shut out (or at least process less information from) other competing tasks. (Galotti, 2008)

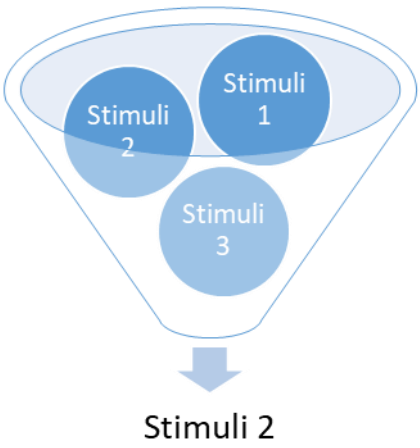


figure 1. selective attention: selection of one stimulus among others

Dichotic Listening Task

"Dichotic Listening is a psychological test commonly used to investigate selective attention and the lateralization of brain function within the auditory system." (Contributors, 2021)

In a conventional dichotic listening task, a person is introduced to two different auditory stimuli concurrently, each into different ear through headphones. Depending upon the type of test, the replies are demanded from what the participant hears.

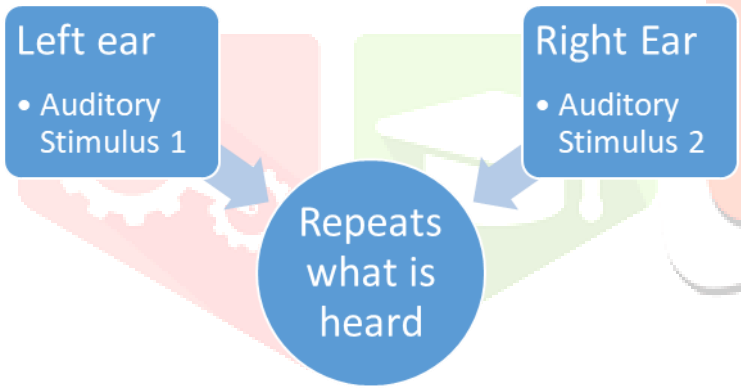


figure 2. a rudimentary dichotic listening task

Dichotic Listening Task Designs

There are various types of designs used while experimenting with Dichotic Listening Task, like

- Dichotic Fused Word Test (DFWT)
- Dichotic Listening Task- Emotional Version
- Manipulation of voice onset time (VOT)
- Selective Attention Shadowing

As Explained by Galotti, "A person listens to an audiotape over a set of headphones. On the tape are different messages, recorded so as to be heard simultaneously in opposite ears. Participants in a dichotic listening task typically are played two or more different messages (often text borrowed from literature, newspaper, stories or speeches) and asked to "shadow" – that is, to repeat aloud- one of them. Information is typically presented at a rapid rate (150 words per minute), so the shadowing task is demanding. At the end of the task, participants are asked what information they remember from either message – the attended message or the unattended message. " (Galotti, 2008)

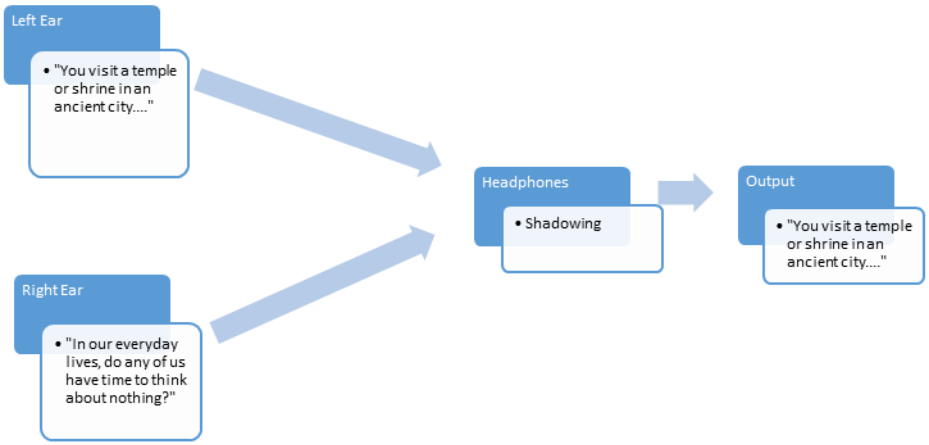


figure 3. dichotic listening task: selective attention shadowing

The argument behind this task is due to simultaneous playing of different recordings expeditiously in both ears, the task of concentrating on the message to be shadowed requires large amounts of mental resources. As a result, there remain hardly any mental resources to process information related to the non-shadowed task.

Working Memory

Working memory is a cognitive memory system with limited capacity for storage of information related to perception. Unlike short-term memory, the manipulation of the stored information is permitted.

Experimental Theories regarding capacity of working memory

There has been extensive research work done regarding explanation of capacity of working memory, which also helps to understand how the processing of attended and unattended tasks takes place. Few notable works are as follows:

Decay theories

They work on the assumption that working memory traces decay over time, if not refreshed by rehearsal of the information. The most elaborate model proposed from this school of thought is "time-based resource sharing model" (Barrouillet, Bernardin, & Camos, 2004). This theory assumes that there exists an attention mechanism which is needed to both refresh the traces and process new information. When processing does not require immediate attention, the time is utilized to refresh existing traces. Therefore, forgetting is proportional to amount of processing conducted, which can be termed as "cognitive load", that is, more the cognitive load, less the refreshing of traces, and more is the forgetting.

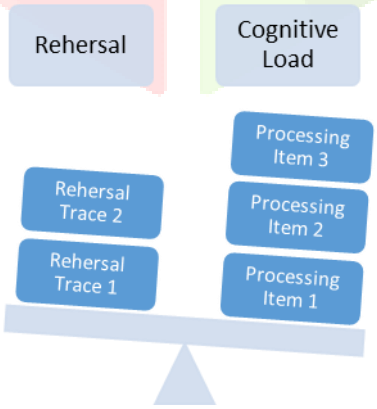


figure 4. more is the cognitive load, less is the rehearsal: decay theory

Interference theories

They work on the assumption that the space in working memory is limited and new information keeps on replacing the older traces.

Another notable assumption is 'retrieval competition', which can be clearly seen in experiments related to memory drum, where during memorization of a list, the retrieval of the first item leads to accidental retrieval of second item too, due to proximity and both compete for retrieval. The chances of retrieval of these items are higher than those in middle of the list.

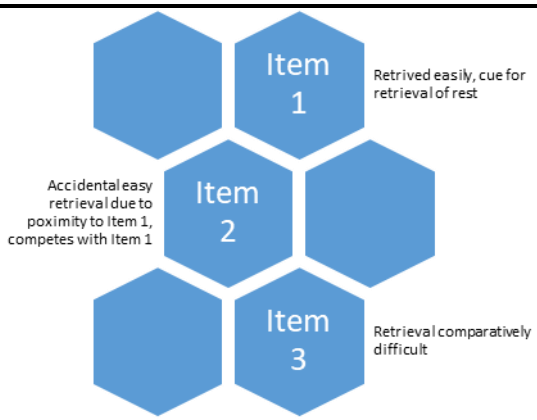


figure 5. retrieval competition

One more remarkable assumption which can be discussed is 'superposition', which states that if multiple representations are added on top of one another, they blur each other's properties and thus make retrieval difficult (Oberauer, Lewandowsky, Farrell, Jarrold, & Greaves, 2012)

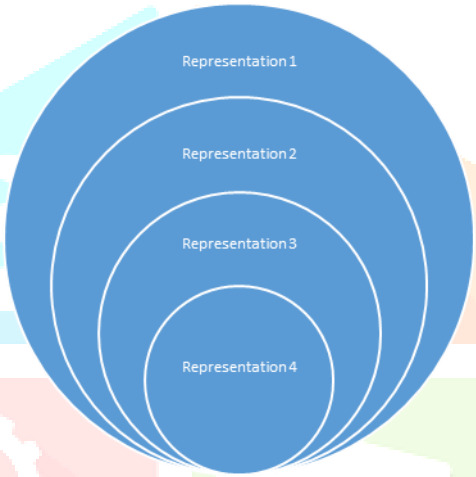


figure 6. superposition

A fourth assumption is also propagated, called 'feature overwriting' (Oberauer & Kliegl, 2006) (Bancroft & Servos, 2011). It proposes that everything stored in working memory is represented by a bunch of features, by which it can be identifies. If two items share the same features, they tend to overlap, or one items claims the features belonging to another. More similar items stored in working memory leads to more overlapping, and more degradation of features of each of them.

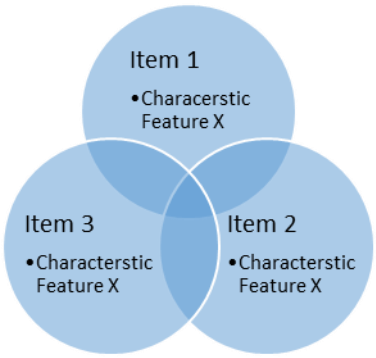


figure 7. feature overwriting: overlapping of items with similar characteristic

Sementics

While considering semantics, the languages L1 (Marwari-Rajasthani) and L2 (Hindi) were deemed semantically similar, as they are both Indo-Aryan languages, originated out of Vedic-Sanskrit. They are both written and read in the same *Devanagari lipi*, and many words from the languages are same or similar in meaning and usage. Phonetically, both languages are similar too, L1 being a local dialect of L2 in the area from which the sample was adopted. However, L3 (English) is considered different semantically, as it is a West-Germanic language, with its

vocabulary influenced by Old Norman French and Latin. It is read and written in Latin (English alphabet) and is not a native language in the area from which sample was adopted.

Methodology

Problem

To explore the influence of the order of languages learned over attended message in a Dichotic Listening Task

Objectives

1. To explore the relation between semantics of languages and preference of language.
   1.1. To study if any difference exists between preference of L1 and L2
   1.2. To study if any difference exists between preference of L2 and L3
   1.3. To study if any difference exists between preference of L3 and L1

Hypotheses

1. H1. There would exist no influence of semantics of languages over preference of language
   1.1. There would exist no difference in preference of L1 and L2
   1.2. There would exist no difference in preference of L2 and L3
   1.3. There would exist no difference in preference of L3 and L1

Sample

A stratified random sample of 120 college students was selected from the population for the study. These students belonged to Jodhpur city with their L1, or the first language/ mother-tongue being Marwari-Rajasthani. It was ensured that

- L1 (Marwari-Rajasthani) was spoken at their house frequently while conversing and the first language they learned.
- L2 (Hindi) was learned at an early stage, right before going to school or at time of going to school.
- L3 (English) was learned at school and was not frequently spoken at home or between peers, but the subject was proficient in the language.

The total sample consisted of 80 male and 80 female students.

Gender	Number of students
Male	60
Female	60
Total	120

Variables

Independent Variables in this research are:

- Difference in semantics of language
  - Language with similar semantics (L1 and L2)
  - Language with different semantics (L3)

Dependent Variable in this research is Preference of Language

Result

To analyse whether any difference exists between preference of language on the basis of similar or different semantics, following analysis was done:

To study if any difference exists between preference of L1 and L2

To check this, a comparison was drawn between no of times L1 was preferred and no of times L2 was preferred throughout the research.

table 1. chi-square for semantic preference of l1 and l2

Variable	Null Proportion	Observed Count	Expected Count	Residual (Obs-Exp)	Pearson Residual	Standardized Residual	X^2	P-value
L1	0.500	177	162.5	14.5	1.14	1.61	2.59	0.10
L2	0.500	148	162.5	-14.5	-1.14	-1.61		
Total	1.00	325	325					

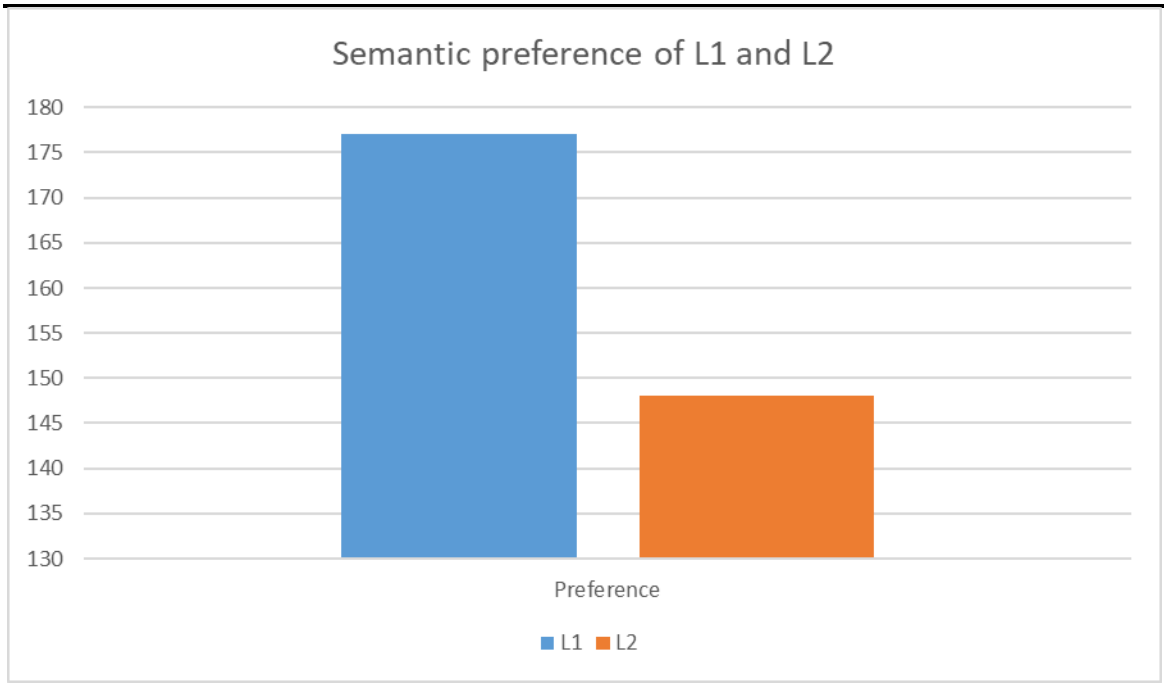


figure 8. semantic preference of l1 and l2

While analyzing differences in preferences occurring due to semantics of language, difference between total no of times L1 was preferred and total no of times L2 was preferred were analyzed. It was found that for observed count of 177 for L1 and 148 for L2, against expected count, the residual came out to be 14.5 for L1 and -14.5 for L2. The value of chi-square (X^2) came out to be 2.59. For Df =1, the value of X^2 is non-significant at 0.05 level and 0.01 level.

At the beginning of the research, a null hypothesis was adopted, which claimed that there would be no difference between the two variables. To check if this stands true or not, the p-value was calculated, which came out to be 0.1. The value is >0.05, which indicates that the chances of the null hypothesis being rejected is low.

To study if any difference exists between preference of L2 and L3

To check this, a comparison was drawn between no of times L2 was preferred and no of times L3 was preferred throughout the research.

table 2. chi-square for semantic preference of l2 and l3

Variable	Null Proportion	Observed Count	Expected Count	Residual (Obs-Exp)	Pearson Residual	Standardized Residual	X^2	P-value
L2	0.500	148	91.5	56.5	5.91	8.35	69.78 **	<0.0001
L3	0.500	35	91.5	-56.5	-5.91	-8.35		
Total	1.00	183	183					

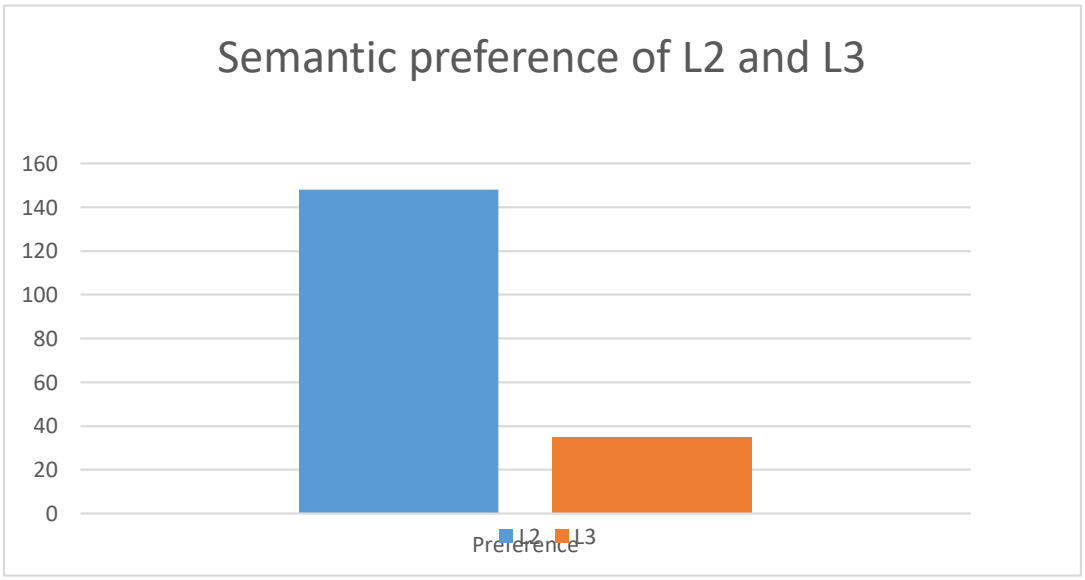


figure 9. semantic preference of l2 and l3

While analyzing differences in preferences occurring due to semantics of language, difference between total no of times L2 was preferred and total no of times L3 was preferred were analyzed. It was found that for observed count of 148 for L2 and 35 for L3, against expected count, the residual came out to be 56.5 for L2 and -56.5 for L3. The value of chi-square (X^2) came out to be 69.78. For Df =1, the value of X^2 is significant at 0.01 level.

At the beginning of the research, a null hypothesis was adopted, which claimed that there would be no difference between the two variables. To check if this stands true or not, the p-value was calculated, which came out to be <0.0001. The value is <0.01, which indicates that the chances of the null hypothesis being rejected is high.

To study if any difference exists between preference of L3 and L1
To check this, a comparison was drawn between no of times L3 was preferred and no of times L1 was preferred throughout the research.

table 3. chi-square for semantic preference of l1 and l3

Variable	Null Proportion	Observed Count	Expected Count	Residual (Obs-Exp)	Pearson Residual	Standardized Residual	X^2	P-value
L1	0.500	177	106.0	71.0	5.91	6.90	95.11 S	<0.0001
L3	0.500	35	106.0	-71.0	-5.91	-6.90		
Total	1.00	212	212					

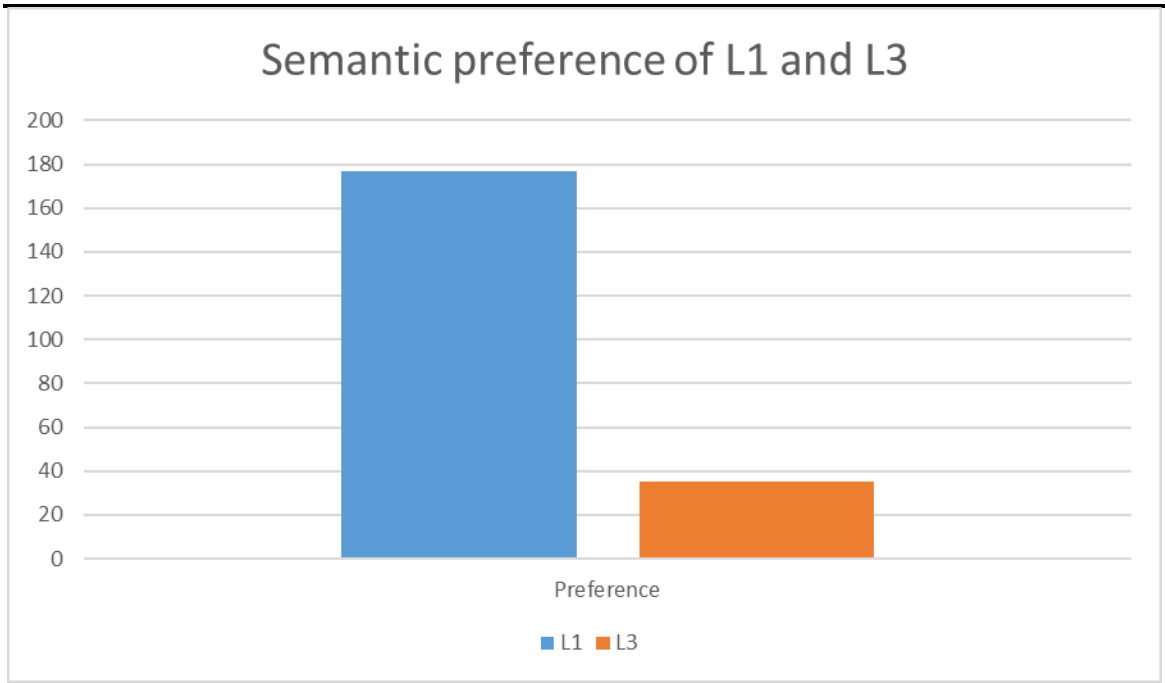


figure 10. semantic preference of l1 and l3

While analyzing differences in preferences occurring due to semantics of language, difference between total no of times L1 was preferred and total no of times L3 was preferred were analyzed. It was found that for observed count of 177 for L1 and 35 for L3, against expected count, the residual came out to be 71.0 for L2 and -71.0 for L3. The value of chi-square (X^2) came out to be 95.11. For Df =1, the value of X^2 is significant at 0.01 level.

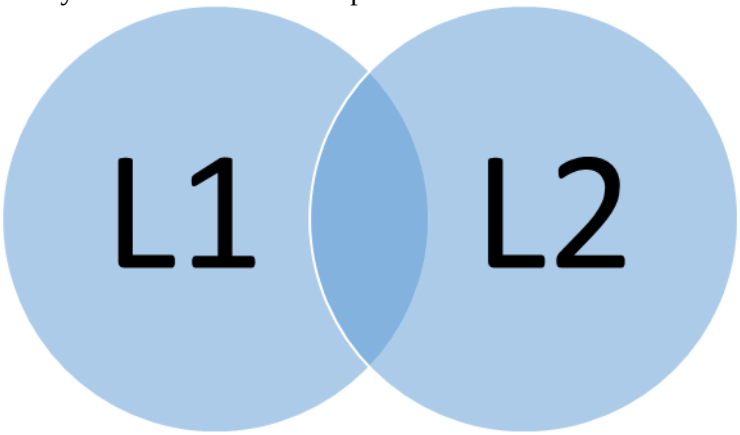
At the beginning of the research, a null hypothesis was adopted, which claimed that there would be no difference between the two variables. To check if this stands true or not, the p-value was calculated, which came out to be <0.0001. The value is <0.01, which indicates that the chances of the null hypothesis being rejected is high.

Discussion

The result for table 1 seems to be in contradiction to the results obtained by Kik, Declerck, Kemp and Kempe (2021) where a dialect with similar semantics was preferred over the language. This result also gives a premonition that there might not exist difference in preference of languages which are semantically similar. However, the result of table 2 and table 3 indicate that when two semantically different languages are compared, the language semantically similar to the language learned first, L1, might stand a high chance of getting chosen than the language semantically different.

It can be deduced that there exist no significant differences between choice of language with similar semantics, but there exists significant difference between choice of language with different semantics. This result can be interpreted as – if a language is high in hierarchy of order of learning, language with similar semantics will also have a high chance of getting attended and language with different semantics might have a low chance of getting attended.

A possible explanation of this result occurring can be done according to the interference theory's 'feature overwriting' (Oberauer & Kliegl, 2006) (Bancroft & Servos, 2011), where because L1 and L2 share the same features, they tend to overlap and some features of L2 might get mistaken for



L1.

figure 11. possible feature overwriting of l1 and l2

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