The effect of kinesthetic stimuli on the learning

Words in the second language

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Abstract.

This paper considers a rather under-studied research problem of the effect of kinesthetic stimuli on the learning of new words in a second language and the use of said techniques in modern classrooms in order to boost students' interest in this line of study. The researcher has used various studies on kinesthetic learning and other learning techniques as a background for her own experiment. Two-condition experiment was set to determent how an added kinesthetic stimuli – a ball thrown to the participant will influence the number of memorized words from a foreign language. The results of the research questions, which were assessed based on this experiment show that on average, the difference in performance of the participants in two groups was comparable. The participants memorized more words in the condition one - not exposed to the additional kinesthetic stimuli, than while being in the condition two – being exposed to a kinesthetic stimuli. This insignificant difference in number of words learned was balanced by the significantly increased level of engagement of students in the task of acquiring new words, while being exposed to a kinesthetic stimuli.

Keywords: kinesthetic learning, stimuli, learning games, second language word learning

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Introduction

During the past decade, educational research has identified a number of factors that account for some of the discussions in how it is essential for some learners to simultaneously engage their bodies and their minds in the procedure of acquiring new information. I want to examine whether combining kinesthetic stimuli will help students memorizing new words while learning a second language. In elementary schools and kindergartens many pupils acquire new knowledge by exploring and doing. Same can be said about the way infants perceive new information, by sensory engaging with the objects. It is essential in the early stages of the development of a child to be able to feel and understand the concept of words through movements and tactility. Therefore, this paper will investigate the effects that incorporating kinesthetic methods of learning has on memorizing of new information, and engaging students.
 The theoretical background will include the studies on different types of learning, with the focus on kinesthetic learning, the importance of a pattern in the learning technique and multitasking during the acquisition of new words in a foreign language and the implementation of games in this procedure.

Chapter 1

Literature Review

Second language learning techniques

During the past years, scientists have indicated how important is the learning of the vocabulary in the process of the acquisition of a second language (Allen, 1983; Nation, 1990;). And yet, the students still continue experiencing difficulties with this part of the language acquisition after they are done with the initial stage of this process. There has not been enough studies about the vocabulary acquisition, especially in the field of the process itself and how students can adopt their own techniques and adapt old ones according to their individual needs.

Lawson and Hogben (1966) have conducted a series of experiments to gain the information on that issue. They have observed a group of 15 quite experienced foreign language students as they tried to learn the meanings of new words. They gave the participants several sentences in Italian language with one word unknown to them. They had access to the dictionary and were asked to think aloud about how they attempted to memorize the meaning of the word for the long-term use. The experiment showed experienced second language learners in

the role of the creators of their own second language vocabulary acquisition techniques. They have consulted the dictionary about the meaning of the word based on the guess and the association they have made and then proceeded on memorizing it. As the result of their experiment, they have discovered the participants using following techniques:

- Repetition, which included Reading of Related Words – 15 participants, Simple Rehearsal – 14,Writing of Word and Meaning - 6,Cumulative Rehearsal-3.

- Word Feature Analysis which consisted of Spelling – 7 participants, Word Classification – 4, Suffix -3

- Simple Elaboration , which consisted of Sentence Translation – 12 participants, Simple Use of Context – 13, Appearance Similarity – 7, Sound Link -3.

- Complex Elaboration , which consisted of Complex Use of Context – 11 participants, Paraphrase – 11, Mnemonic -3.

The most commonly used techniques used by the student had some version of repetition. Other common methods that a student can use in the process of memorizing the vocabulary of the second language is creating a set of cards with the word and its meaning on the other side, or the collecting new words in the personalized copy book, or writing them above the text in the context of a sentence, Mondria and Mondria-de Vries (1994)

Multitasking

In the modern world, where children and young adults have access to Internet and various means of media and technology "The World Wide Web has had a significant effect on the way they think and learn. They are used to thinking on multiple tracts at once, but have little patience with linear reasoning or delayed gratification" (Teed, 2010). That is why there is a necessity to rethink the classical ways that students are given information at school. Especially when they are taught languages. As the basic process of memorizing the vocabulary is a dull process, that requires constant repetition of the same words multiple times, students can be seriously discouraged to continue with the study. One of the possible approaches to closing this particular gap is the implementation of new games. That will combine kinesthetic movement with basic cognitive functions of the brain.

Patterns in learning a language

Training of memory is essential for any learning process, especially during the study of words from the foreign language vocabulary. It is important to give the brain time to try and recall the word. If the student fails to do so, he or she should go back to the source, look at the word and try to remember it in time again. Scientists conducted various experiments to support this. In his experiments Ebbinghaus (1913) showed, that there should be brief pauses between the patterns of repetitions, during which human brain will be busy remembering the associated words from the vocabulary. Moreover, if the brain works with pauses, it will not get tired so easily. Anderson (1973) also worked on this issue and proposed an associative-chain model. He hypothesized that pauses help forging the associations between the learned elements and help during the further recollection of these elements. This happens, because any organization of the elements in the brain facilitates the process of learning and finding. The ability to recall is a result of the creation of these associations or links between stimuli and reactions. And the ease with which the brain tries to remember is correlated with the strength of these links. Anamnesis is the procedure during which the information that needed to be remembered is first being presented and then the "key" is being given to help "recover" the information. A design pattern is a "template" description of a solution to a problem that has been previously encountered by the student and later solved. During language acquisition a pattern will help represent in a basic form, the steps that language learning procedure uses in a learning task, and which helps the student remember the vocabulary or any data needed. Patterns therefore also help the creators of learning books, games or software design language tasks without having the professional language teaching background. Using pattern in the procedure of creating these tasks can also help gather information after the task and allows the designers and even students to change it according to their needs.

Learning games

It has been suggested, that educational games can be a powerful vehicle for learning, and that artificial intelligence could strengthen the learning outcomes of such games. Johnson, Vilhjalmsson, & Marsella (2005) suggest that the learning principles that good learning games incorporate are all strongly supported by contemporary research in cognitive science, that studies human thinking, learning and general acquirement of information through laboratory experiments, studies of the human brain, and research at actual learning sites like classrooms and workplaces (Lave 1996). Modern game designers employ a range of techniques to promote

long-term user engagement and motivation for further continuation of the study process. Yet language-learning games and platforms use a rather limited amount of techniques, usually focused on a visual and associative stimuli.

Games are effective tools for learning because they offer students a hypothetical environment in which they can explore alternative decisions without the risk of failure. Thought and action in such games are combined into purposeful behavior to accomplish a goal. "Playing games teaches us how to consider alternatives, and to think flexibly" (Martinson and Chu 2008: 478). All of that makes the process of studying more motivating and significantly more engaging. "Learning through performance requires active discovery, analysis, interpretation, problem-solving, memory, and physical activity and extensive cognitive processing" (Foreman 2003: 16).

Furthermore, teachers or the student himself will be able to control his or her own pace of study and be able to make observations and change the options of the game. Also students will not be pressured by the fear of performing badly in a classroom full of his or her peers and teachers. "The learning process should be interesting, easy and it should be fun to learn. It also should fit with an everyday task and the working environment in order to achieve optimum results" (Pivec & Dziabenko 2010: 1).

Games often incorporate logical reasoning, communication, kinesthetic, visual stimulation and spatial relations. They also include analysis and interpretation of new and old material which makes learning concrete. Furthermore, the hands-on experiences are integral to critical learning, retention and recall of information acquired in the process.

Textbooks and materials are slowly changing from being essentially analytic, auditory, and visual to becoming increasingly global, kinesthetic, and tactual (Fine 2003). Thus, designers of learning game programs face and largely solve a serious educational dilemma, one also faced by schools and workplaces: how to get people, often young students, to learn and master something that is long, repetitive and challenging.

Another issue, is that students in schools are not usually offered alternatives in how the information can be acquired in a better and more fruitful way for them. Too often they "consume, but do not produce, knowledge", and rarely get to help design the curriculum. (Brown 1994). There can be a certain challenge to create learning games that will allow the students to change the options based on their own experience and timing. But by adjusting it for himself or herself, a student will be able to acquire information on his or her own terms. As game will create a "cycle of expertise… until players achieve a routinized, taken-for-granted mastery of

certain skills " (Bereiter and Scardamalia 1989). This cycle is the basic foundation for producing expertise in any subject. Good educational games are models for the production of expertise.

Motivation in learning

Motivation is the most important factor that drives learning. When motivation dies, learning process is also finished. Cognitive science has had certain difficulties in defining the term, though one definition is "a learner's willingness to make an extended commitment to engage in a new area of learning" (diSessa 2000). Since engaging games are highly motivating to a big amount of people, we can understand from them how motivation is created and sustained, and use that knowledge to create a more engaging learning process for students.

In computer and video games, players engage in action from afar, much like remotely operating a robot, but in a far more "fine-grained" fashion. Cognitive research suggests that such fine-grained action at a distance actually causes humans to feel as if their bodies and minds have stretched into a new space (Clark 2003), which is a highly motivating state. Books, movies and TV-shows, for all their qualities, cannot do this. This investment appears to be the deepest foundation of a player's motivation in sticking with and eventually mastering a game, a certain skill or acquiring new information.

Alex Games (2010) curriculum and learning sciences expert and educational design director for Microsoft proposes that "we can encourage kids to use their motor skills and to learn using their body in immersive experiences. This new way to play allows children to learn by interacting and engaging with content in novel ways." Implementing more games can also widen opportunities not just for learning language, but also for broadening the students' learning and teacher's teaching styles.

In his study Reid (1987) found that the preference among English Language Learners for language lessons was Tactile/Kinesthetic learning that involvement movement and memorizing new information by a wide margin, compared to classical techniques. It is important to use more physical and kinesthetic elements into language learning procedure.

Games where body responses are used, or learners interact with objects as part of the game, can be called tactile or kinesthetic. Language learning games with these elements are associating physical activity and touch with specific meanings. They can be divided into three broad groups: Touch Games, Spatial Games, and Craft Games. These are some examples and rules of kinesthetic language learning games taken from the web site Ehow.com:

<u>Touch Games</u> – The most common games involving touch are those based around having real items inside a bag, so that students have to touch the items and then perform certain tasks. These tasks are what differentiate the level of difficulty. The easiest version simply has students identify the objects that they touch in the bag. This is often a vocabulary game. To make it more difficult, the students have to describe what they are feeling, while the rest of the class tries to guess what it is.

<u>Spatial Games</u> – These games involve rearranging items or people and can be both kinesthetic and tactile. They include traditional games like charades and less traditional games, like Population Punctuation, where all but one person in class has a card with words or punctuation on it and the one person who tries to arrange the people at the front of the class so that the cards make a correctly punctuated sentence using as many people as possible.

<u>Craft Games</u> – Any game where the students have to actually assemble something, like Lego Negotiations where students have to negotiate with other teams for certain pieces to create their Lego creature according to the directions they've been given. This can be done with home made tangrams if you don't have access to Legos. Map drawing is another good example, and it can also combine elements of auditory learning since the teacher will tell the students what to draw on their map.

<u>Modified version of Memory game</u>. Write words or desired concepts on large pieces of paper. Make duplicates for each concept. Spread the papers out on the floor face down. Students will need to move around the room to flip over the pieces and make matches.

Kinesthetic and learning

Various studies have been conducted in the educational field, concentrated on the learning procedures and the ways humans acquire knowledge. Some of them focus on various learning styles. The vast majority of these studies affirmed the significant effect that kinesthetic learning opportunities have on cognitive performances.

The teaching manner that uses the approach of the brain enhancement is called brain-based learning. Ratey (2002), alleged, that cognitive neuroscience has discovered more connections between movement and learning. He referenced the experiment conducted by Goodwyn (2000 et al.). Goodwyn studied 103 infants, 45 girls and 58 boys and came to the conclusion, that infants, who were aided by their parents during the acquisition of language by reinforcement of symbolic gesturing linked with the verbal word for the object or action, got

better results in acquiring new words. It was concluded this form of kinesthetic expression of language enhances a child's language learning procedure. The study illustrated a significant increase in language acquisition between infants who combined symbolic gesturing with verbal speech over infants who only verbalized. From this it can be hypothesized, that the acquisition of language of older children and adults can be also increased via movement to brain stimuli.

Several scientific papers have been written through the 20th century by various scientists, studying the human brain and its capacity to acquire new information. They have proposed the idea, that different people tend to perceive information differently. These scholars have made several classifications based on human perception of data.

Bruner (1967) identified several stages of cognitive development, through different combination of human senses. He created a model that allows to put humans into certain categories: Visual- pictures, auditory-listening, visual/iconic- reading and writing and kinesthetic- movement and tactile ability. Later in his work Fleming (2004) continues this discussion and the implementation of this division of cognitive development and searches the way to implement it into the teaching style. He calls his system of human information acquiring - VARK, which is an acronym for Visual, Aural, Read/Write, and Kinesthetic. The idea stays the same as his colleague's, that visual learners acquire knowledge better through pictures and graphs. Aural learners get information more successfully by hearing what the lecturer says. Read/Write students perceive information better through text, printed or hand-written words. Kinesthetic learners need experience and practice and movement in order to study and perceive data. They need to engage their bodies simultaneously with their minds.

Another attempt to explain the capabilities of human brain to acquire information was done by Gardner (1999 & 1993b) He proposed a Multiple Intelligences (MI) theory. This study deviates from previous works in this field, though it also opposes the traditional view on how humans perceive information. Gardner proposed, that the brain is not static and requires training and experience, and can be divided into various kinds of intelligence. He uncovered eight theoretical types of intelligences that can be used on a more advanced level during the learning process of different subjects. He added that none of these eight types of intelligences operate in isolation from each other. He concluded, that humans usually possess certain combinations of them, which allow a more fruitful learning procedure. In his proposed system Gardner identified:

- Logical-mathematical intelligence, which allows a more systematic approach to the acquirement of information.
- Linguistic intelligence, which is a more sensitive to language and text.

- Musical intelligence, with a more enhanced acquisition of rhythm, pitch, sound and all musical forms.

- Spatial intelligence, that perceives the experience of learning spatially and helps recreate the visual data in the human brain.

- Interpersonal intelligence, which allows to understand emotions on the personal level, communicate with the human beings and acquire information with their help.

- Intrapersonal Access to one's own feelings, which is the ability to understand your own emotions and model your own behavior.

- Naturalist intelligence that allows humans to co-exist in the natural world harmoniously and be more attuned to the surroundings.

- Bodily-kinesthetic intelligence, that is responsible for the movements of the body and tactile acquisition of the knowledge.

Gardner stated, that this division of the human mind can be used, so "educators can reach many more students, and affect them much more deeply, by activating the multiple intelligences of their students." He opposes his idea to the more classical uniform approach to education, and welcomes the idea of education system, that can meet the "the needs and desires of a significant portion of the world's population."

Dunn, (1995) has also conducted experiments in this field and they concluded quite similar results to Bruner(1967), that learners have four basic perceptual learning channels:

1. Visual learning: reading, studying charts

2. Auditory learning: listening to lectures, audiotapes

3. Kinesthetic learning: experiential learning, physical involvement with a learning situation

4. Tactile learning: "hands-on" learning, such as building models or doing laboratory experiments.

From their experiments Dunn and Dunn (1979) concluded that only "20-30% of school age children appear to be auditory learners, that 40% are visual, and that the remaining 30-40% are tactile/kinesthetic, visual/tactile, or some other combination". Price, Dunn, and Sanders (1980) found that young children are the most tactile/kinesthetic. One of the conclusions was also that there is a gradual development of visual strengths through the elementary school years, and that only in fifth or sixth grade can most young pupils acquire and retain information through the auditory sense.

This part of paper suggests, that various scientists have attempted to build the foundation for the continuing study of kinesthetic influence on the learning capabilities of the human's

brain. These works include extensive characteristics of the possibility of the Multiple Intellects instead of the unified one in every human being, as proposed by Gardner (1999), Bruner (1967), Fleming (2004), and Dunn(1979).

Also the teaching manner that uses the approach of the brain enhancement is   called brain-based learning was researched by Ratey (2002), who alleged, that cognitive neuroscience has discovered more connections between movement and learning. He based his theory on the experiment conducted by Goodwyn et al. (2000) who came to the conclusion, that infants, who were aided by their parents during the acquisition of language by reinforcement of symbolic gesturing linked with the verbal word for the object or action, got better results in acquiring new words. It was concluded that form of kinesthetic expression of language enhances a child's language learning procedure. From this it can be hypothesized, that the acquisition of language of older children and adults can be also increased via movement to brain stimuli.

Chapter 2

Purpose

I found the research on the various teaching and learning styles highly interesting. Fresh out of university, with a previous degree in linguists, I had to encounter countless of hours in the classroom, engaging in traditional learning styles, while acquiring a second language. The tasks usually required simply reading of the texts and memorizing new words and expressions. During the prolonged exposure to this task, students tended to lose attention and switch to different distracting occupations.

In this study I want to check, if the element of   kinesthetic stimuli will help trigger short-term memory and allow the student to remember a list of words from a vocabulary of a new language more efficiently. Such educational games or platforms can be created for popular video gaming consoles as XBOX360 (Kinect), PlayStation 3(Move)and Nintendo Wii, that allows the student to engage into the language-learning process using special controllers and added 3d-environment. Similar other learning platforms on these gaming consoles are "Body and Brain Connection[1]" and "Are you smarter than a 5 grader" that allow a student to learn new information through a more playful way.

 I perceive, that modern classrooms are adequately occupied to engage students into more stimulating and motivating ways of learning. Previous research, outlined in the literature reviews in previous chapter concluded the positive effect of kinesthetic learning technics on the process of acquiring skills and data. In my experiment I would like to research if kinesthetic stimuli will affect memory, triggered during learning words from a second foreign language.

Knowing that will allow creating new interesting ways of learning a second language. It will also allow certain levels of adaptability to the process, and the students will be I able to take control of their own pace of acquiring words from the vocabulary of a new language.

One of the barriers, that stops modern schools from accepting similar approaches to teaching a second language, are the unified methods, that do not allow the education system to cater to different types of students. Kinesthetic approach to learning a second language will not be a difficult system to implement, but will certainly allow more differentiation. I offer the technique that would allow students to regulate their own studying according to their learning without great struggle for the teachers to control this process. This could be done by giving students the information on their own preferences and taking some time to initially teach students strategies that allow them to work to their strengths.

Research Question:

1. What is the effect of kinesthetic stimuli on second language learning?

Hypotheses

1. Is there a significant relationship between the number of words memorized in second language learning (as determined by comparing the number of words memorized with condition one- without a kinesthetic influence of the ball on the process, and condition two – with added kinesthetic stimuli of the ball) and the added kinesthetic stimuli?

2. Is there a significant relationship between the level of interest the students show in memorizing words in the second language learning (as determined by comparing the level of boredom in both conditions) and added kinesthetic stimuli?

Null Hypotheses

1. There is no significant relationship between the number of words memorized in second language learning (as determined by comparing the number of words memorized with condition one, and condition two) and the extra added kinesthetic stimuli.

2. There is no significant relationship between the level of interest the students show in memorizing words in the second language learning (as determined by comparing the level of boredom in both conditions) and extra added kinesthetic stimuli.

Methodology

The purpose of the methodology chapter is to describe the design and implementation of the quantitative research study. A quantitative approach was necessary to provide statistical evidence concerning the relationship between the number of words memorized in the vocabulary of new language and the presence of the kinesthetic stimuli in the experiment. The researcher has used a between-subject approach with two groups of eighteen people each with two conditions, that allow to measure the effect needed. The conditions were identical, but for one difference: the added kinesthetic stimuli- the ball. A questioner was used to determine the level of interest, the participants took in the experiment in both conditions and therefor to find a relationship between the condition with the extra task and without it.

Participants

The sample for the experiment consists of students from Tilburg university participants pool in the Netherlands. In order to easily deal with the data collection process during the actual experiment, the researcher was given a sample of students and the facilities within the university. The participants were chosen randomly, they did not have the prior knowledge about the peculiarities of the experiment. The researcher issued only the title of the experiment and the time, required for participation. After the experiment the students were given a small questioner. They needed to fill in their name, gender, age, occupation, predisposition to languages (number of languages learned), if they had a degree in languages, or linguistics, and on the scale of one to five the level of boredom they experienced during the experiment. One being "a lot", Two being "quite boring" , Three being "normal", four being "engaging ", five being "fun".

The participants in the study included 38 students from Tilburg university aged from eighteen to twenty seven. Sixteen of those students were male and twenty two were female. The results of the final questioner showed that the average number of languages learned through the duration of the participants' lives is 4. And only two of the students possessed special linguistic education.

All participants received the instructions of the experiment beforehand.
The sample was equally divided into two parts. Eighteen test-subjects –Group 1 were asked to memorize a list of 20 word pairs (Language 1 and Language 2) from the screen. The cycle of the word-pairs was repeated three times with thirty second interval each to rest. Each word-pair appeared on the screen for five seconds with the two seconds blank screen in-between the word-pairs. Each word pair appeared five seconds on the screen.

After that the participants were checked to control the outcome of the experiment. They were given each a multiple choice test from the web site testmoz.com as shown on the picture below. In this test the participants needed to choose the meaning of the word from a new language from four words in English. The words were mixed, so the student will not be able to memorize the order of the words.

The platform allowed to create a simple multiple choice test, setting the number of choices for each examined word. At the end of the test, the web-site provided the number and the

percentage of correct answers for each individual participant and indicated those words, where the mistakes were made. The platform also allowed to check the statistics on the words, which were the most difficult to remember. There was also a possibility to check the time, each participant took to go through the test. Average time of all the participants was 2 min. and 23sec. With the longest time of 4 min. 22 sec. and the smallest amount of time 1 min. 14.sec. All the participants managed to finish the test in 5 minutes given time. Overall time of the experiment was circa 20 minutes.

Group2 was also asked to memorize a list of 20 word pairs (Language 1 and Language 2) from the screen. Each word pair appeared five seconds on the screen and the cycle of twenty words was repeated three times. The difference included an extra kinesthetic stimuli, provided by the researcher. The participants had to catch and throw back a ball every two or three seconds. That delivered the required distraction for the experiment.

Setting

The experiments were conducted at Tilburg University in laboratories PZ47, PZ46, PZ102.The equipment used for the experiment consisted of the overhead projector for participants to see the word-pairs on the screen, a computer for the multiple choice tests and the questionnaire. To insure the necessary implementation of the kinesthetic stimuli on the participants during the experiment , the researcher used three rubber balls, in case one of the students or the researcher dropped the ball, so there would be no need to run after the ball and lose time. The researcher and the participants sat approximately one and half meter from each other. The participants were facing the screen with the projected words on it.

Experimental material

In order to conduct the experiment on the effect of kinesthetic stimuli on the learning of the words in the Second Language Learning, I have decided to use the random word generator tool to create new words. It was done to avoid the possibility of students recognizing words from the existing languages. Web-site Wordoit.com was used for that purpose. As the authors of the web-site explain themselves, that wordoits are" words that are made-up, but sound right. They follow the rules of phonetics, and if done properly, roll off the tongue." The web site allows to generate new words, that sound "natural", "almost natural" and "hardly natural", by enabling the user to choose a combination of five European languages (English, Spanish, French, Italian, German). Since the researcher was dealing with predominantly Dutch university students, she

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has chosen the combination of English and German, since they are the closest to their native Dutch and Italian word-parts to make them more versatile. One of the tools also permits the user to put a limit to the number of letters and vowels. I have chosen 20 newly generated words, which were limited to two-three syllables, for the purpose of not overcomplicating the task of memorizing them by the participants. Newly generated words also resembled Dutch word structure, since the participants were native Dutch speakers. The final stage of the procedure was to come up with 20 counterpart words in English. These words were selected out of the easiest day to day English vocabulary, that would not require any knowledge of specific English vocabulary. These words have been chosen randomly, in order not to give strong associations with each other as a group like "pillow" and "doctor".

The second step was to ensure, that these new words from L1 did not illicit any associations with the English words from the L2. The existence of said associations could have influenced the procedure of learning words during the experiment. Since the parts from words from the new language were taken from three different languages, the researcher have carefully chosen the random counterpart words in English, so they would not contain the part of the word in any of these three languages. In order to check that, the researcher has asked 5 participants to closely read the new word and write down if he or she can think of the any associations. The chosen newly generated words did not create any associations with the counterpart words in English.

Chanis	Toaster
Belfar	Key
Aricol	Door
Harmal	Ear
Amian	Swan
Svede	Pillow
Aziend	Drug
Tassim	Cat
Mornir	Animal
Richial	School
Getti	Stone
Farit	Doctor
Ambri	Picture

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Pupilot	Bottle
Marrill	Talent
Filand	Rose
Frenal	Mouse
Titud	Monster
Ramar	Floor
Mulad	Chair

Chapter 3

Results

Hypothesis one:

There is a significant relationship between the number of words memorized in second language learning (as determined by comparing the number of words memorized with condition one, and condition two) and the extra added kinesthetic stimuli.

Since in my experiment I had two groups of people, I have used the Independent T-test to compare the results. As the preparation step, I have checked the homogeneity of variance, using the Levene's test. The results show, that the variances are not significantly different and the homogeneity of variances assumption is tenable. $F(1, 36) = 1.3, p = 0.26$

On average, participants memorized more words in condition one - not exposed to the additional kinesthetic stimuli ($M = 16.6, SE = 1.08$) than while being in the condition two – being exposed to a kinesthetic stimuli ($M = 15.6, SE = .7$). This difference was not significant $t(36) = .72, p > .05$. However it represented a small effect size $r = .118$. The number of the words memorized by group one is 16.6 out of 20. And the minimal number is 6 with the maximum of 20. At the same time, the average number of words in the group two is 15.6, with the minimal of 10 and the maximum of 20. At the same time, (see Figure 1.) clearly shows the number of the participants, who remembered all the 20 words is more in the condition one than in the condition two which is six and four respectively.
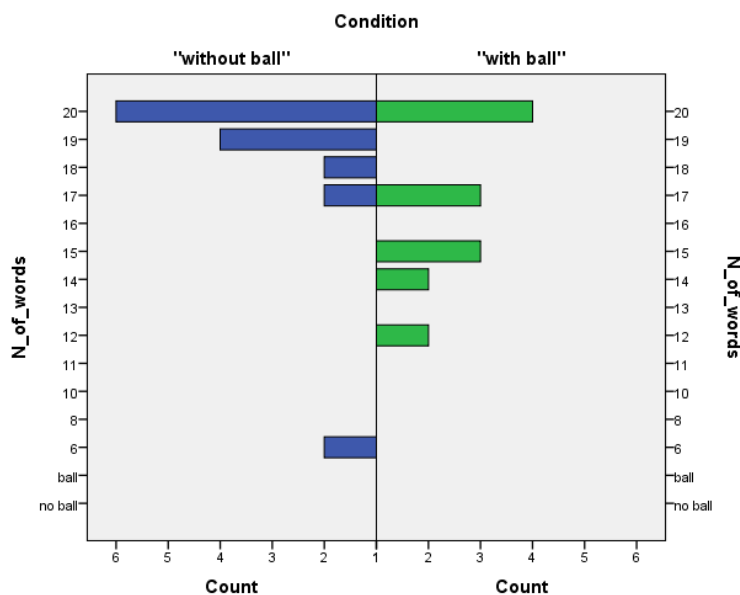

Figure 1 shows the results of the experiment conducted to check Hypothesis 1. It visually illustrates the number of words the participants managed to memorize in both conditions.

Differences in results based on gender

During the experiment another conclusion regarding the results has been made, while taking into the account the gender of the participants. From the results of the experiment, we can see that there were 16 male participants with the average age of $M = 22.8$, $SD = 2.9$. The youngest participants were 19 years old and the oldest were 29. Twenty two participants were female with an average age of $M = 21.1$, $SD = 2.5$.The youngest female participants were 18 years old and the oldest were 27 years old.

As the preparation step, I have checked the homogeneity of variance, using the Levene's test. The test shows, that the variances are not significantly different and the homogeneity of variances assumption is tenable. $F(1, 36) = 1.3$, $p = .26$

Female students were doing better in both conditions, with an average number of words ($M = 16.72$), while male students scored ($M = 15.25$). The minimum number of words for the female was 6 words, while for male 10. The comparison of the results of number of words memorized by male and female students in the both conditions with the independent T-test showed following results:

In the first without the ball condition as Figure 2 shows us, male participants showed better results ($M = 15.5$, $SE = 1.32$) while female students showed an average of words memorized of ($M = 16.33$, $SE = 1.34$). In the second condition female participants showed better results ($M = 17.57$, $SE = 1.08$) than male students ($M = 14.5$, $SE = .84$); The difference is not significant $t(14) = 1.8$, $p >.05$ it did represent a medium effect size $r =,43$ for male and $t(20) = -0.5$ $p >.05$ and represent a small effect size $r = .127$ for female.
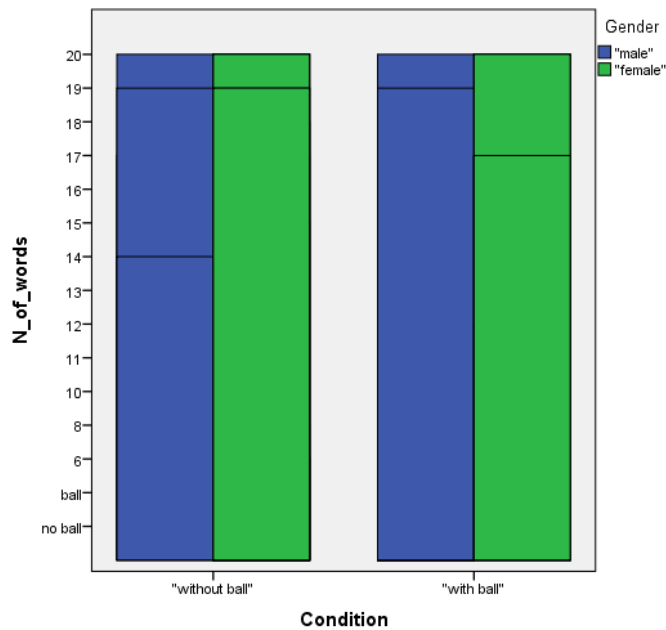
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Figure 2 shows the difference in words learned in both conditions based on gender.

Hypothesis two.

There is a significant relationship between the level of interest the students show in memorizing words in the second language learning (as determined by comparing the level of boredom in both conditions) and extra added kinesthetic stimuli.

The output from the independent t-test provided following results: Group 1 - who were memorizing words from the screen without the kinesthetic stimuli had a mean of interest in the experiment of 1.68, with a standard deviation of .58 . The standard error of the group is .13. In addition the table shows as that the average interest level of the participants who were exposed to additional kinesthetic stimuli - a ball, was 3.9 the standard deviation of .621 an standard error of .14.

On average participants experienced a greater level of boredom, when not exposed to a ball-throwing act, ($M = 1.68$, SE = .13) than with the ball ($M = 3.9$, $SE = .14$) The difference is significant $t(36) = -11.5$, $p < .05$. It represented a large effect size of $r = .83$.

The results provide us with the data that allows us to conclude, that the level of interest and involvement of the test subjects in the condition two was significantly higher. This contradicts with our Null hypothesis and supports the research question. As the Figure 3. clearly shows, the majority of students have chosen four out of the scale of boredom, which stands for quite engaging.
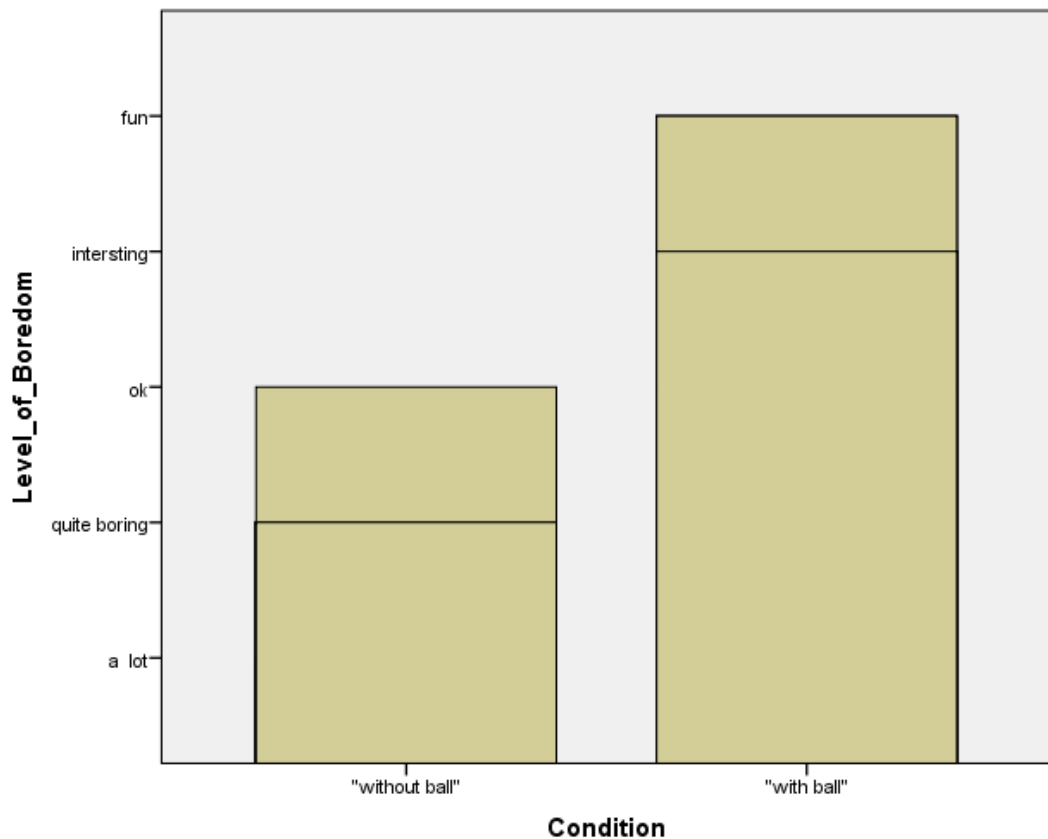

Figure 3 shows the results of the experiment conducted to check Hypothesis 2 and visually illustrates the level of involvement both groups of participants had in the process of memorizing new words.

Discussion

While assessing the data from the experiment we can see, that the participants in condition one memorized more words than the participants with the condition two- with the ball. But the difference was not significant. This contradicts our Hypothesis 1 about the positive influence of the kinesthetic stimuli on the memory. Though the participants were distracted from the primal aim by looking at the ball in order to catch it, it had not stopped the majority of the participants from completing the main task. Some of the participants were also paying attention

to the researcher, despite given clear instructions to look at the screen. As we can see, the difference between the results is not significant. Which brings to the conclusion, that the possible main reason for the results is the own will of the participants to do the experiments. Those, who were concentrated on the task to memorize as many words as they can and fill in the multiple choice tests performed well in both conditions. At the same time, those students, whose attention was diverted from the screen, performed worse than their more attentive peers.

Speaking of the second part of the experiment − assessing the level of involvement of participants in the task, students found the testing experience in condition two more interesting. They were more concentrated on the overall assignment and were less distracted in general, comparing to the group of test subjects with the condition one. The group without the ball tended to look at the screen in order to memorize the words, but after two rounds of following them on the screen, their attention span weathered considerably. At the same time the test subjects who were throwing and catching the ball, divided their attention between the physical act and the focusing on the screen with the word pairs. This divided attention allowed them to find the whole experiment less of a burden, which was one of the key aims of the experiment.

One of the most considerable causes of the decline in words remembered in both above mentioned cases is arguably the human factor. Some students were clearly not motivated enough to score the highest in the multiple choice test. While others have shown clear enthusiasm during the course of the experiment and after. They wanted to know their results and the explanation in both cases.

Probably if the further experiments are to be conducted in the field of studying the effect of kinesthetic stimuli on the learning of the words in the Second Language Learning, then it will be a good suggestion to use the participants, who are either specifically interested in learning languages, or are directly involved in this process at the moment.

As a possibility, the decline in the performance of the participants in condition two, can be explained by the fact, that they had to look away from the screen in order to concentrate on the ball. Further experiments can be adjusted more complexly, and allow the participants to keep the gaze on the level of the words. It can be predesigned mobile application or a game on the popular gaming platforms such as X-Box 360 Kinect, Play Station 3 Move and Nintendo Wii. The gaming controllers of Nintendo Wii and the motion capture devices of X-Box 360 and Play Station 3 allow less attention diversion than a human being with a ball. Since there are several instances when the participant shifted his or her attention on the physical loss of the ball by either him or the person in charge of the experiment. Apps and games on these gaming platforms

will reduce the factor of the predictability, which is inevitable, when dealing with a human being.

One of the things that can use more work in the experiment is the computer generated words, or Language 1. These words used as in the experiment can arguably be more complicated and longer, since a significant number of participants in both conditions managed to memorize the maximum number of words. Perhaps it should be more prudent to use the words not limited to two syllables, in order to make the task of memorizing them more complicated.

The complexity of the experiment can also be increased by altering the mechanics of the execution of the experiment on the pre-stages. For example the number of training cycles can be limited to two instead of three times. It can be calibrated, using more test subjects and analyzed during the preparation part. Also the distance between the person responsible for the ball-throwing and the participant can be maximized in order to make increase the force of the kinesthetic movement.

A potential interest to future research in the area of the influence of kinesthetic influence on the learning of the second language can lie in assessing the long-term effect of the kinesthetic stimuli on the process of memorizing the words. Also the part that needs more substantial experiments in the field is the engagement power of the added stimuli during the process of learning. Knowing that, the educational process can be better calibrated to suit the individual needs of the student in both the physical sense by applying more or less strain on the body and by choosing the mental load in the form of the foreign words the student has to memorize. This can extensively change the usual approach to teaching and acquiring information process by allowing the exercise of both the body and the human memory.

Conclusion

This paper considers a rather under-studied research problem of the effect of kinesthetic stimuli on the learning of new words in a second language and the use of said techniques in modern classrooms in order to boost students' interest in this line of study, which can be rather dull and discouraging . The researcher has used various studies on kinesthetic learning and other learning techniques as a background for her own experiment. The results of the research questions, which were assessed based on two-condition experiment show that on average, kinesthetic stimuli does not support the increase in the effect of the way students perceive new words in the second language, since participants memorized more words in the condition one - not exposed to the additional kinesthetic stimuli, than while being in the condition two – being exposed to a kinesthetic stimuli. This insignificant difference in number of words learned was

balanced by the significantly increased level of engagement of students in the task of acquiring new words, while being exposed to a kinesthetic stimuli. Which lead us to conclude, that while more experiments in the field of kinesthetic learning are advised, in order to trace more precisely the positive or negative effect of the combination of brain and muscle functions on the way a human perceives new data, the positive effect of kinesthetic stimuli on the overall engagement of the students in the task of learning is clearly supported by the results of this paper.

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