Language and Learning: The Effects of Language-Dependent Memory on Punjabi and Mandarin Speaking ESL Students

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Abstract

Previous research suggests that people may remember information more accurately when the language of retrieval matches that of encoding. We investigated this with 45 ESL student subjects, native language Mandarin or Punjabi, recruited from introductory psychology classes at Langara College. Participants read two passages containing academic-type history and biology information, which they were randomly assigned to read in English or their native language, and completed a recall test in English. We hypothesized that students would score higher on the recall test if they read in English, to match the test. Results indicated a significant difference between conditions for Punjabi speaking students, but not for Mandarin speakers. Language-dependent memory effects may vary between languages, therefore future research should examine languages separately or comparatively.

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Students who seek their education in foreign countries, along with encountering many unique opportunities, face many challenges. For many students, the foremost of those challenges is learning in a new language. Educational institutions are profoundly language based. They require students to learn information delivered through spoken and written language, in lectures and textbooks, and to demonstrate their understanding of that information through extensive writing. The work is difficult even for students operating in their native language, and those learning a new language at the same time can find themselves at a disadvantage (Miller & Peleg, 2010). Reading in a new language is sometimes a struggle and, with the increasing quality of translation applications, second-language students may be tempted to translate their readings into their native language in order to make the task a little easier. However, language context may affect what information a person recalls (Marian & Kaushanskaya, 2007).

There are a variety of memory effects upon which the theory of language-dependent memory has been built, all of which have shown a memory advantage when the situations of encoding and recall are similar in the relevant way. State-dependent memory research has demonstrated this link regarding the internal states of the person, such as drug and alcohol induced states (Lowe, 1983; Overton, 1964) and emotional states (Teasdale & Fogarty, 1979; Weingartner, Miller, & Murphy, 1977). Context-dependent memory, which is the influence of surrounding context on recall, was demonstrated in Godden & Baddeley's 1975 study of divers' ability to recall information on land and in the water. They found that a match of environmental context at encoding and retrieval facilitated more accurate recall.

Turning to language, studies of autobiographical memory have found that people are able to recall more memories when the language of encoding and retrieval match then when

they do not (Marian & Neisser, 2000; Marsh, Kanaya, & Pezdek, 2015), and they are also able to retrieve these memories more quickly (Mortensen, Berntsen, & Bohn, 2015). The language-dependent recall effect extends to semantic memory as well, though language proficiency also impacts results: in previous research, the effect has been reliably detectable only when there is no significant difference between participants' proficiency in the languages under investigation (Marian & Fausey, 2006; Marian & Kaushanskaya, 2007).

The present study adds to these findings by specifically investigating the challenges facing foreign language students here in Canada, who will be tested in English in the majority of their courses regardless of what language they choose to study the material in. We hypothesized that students would have higher scores on a recall test when the language of retrieval matched the language of encoding than when it did not, and this effect would be stronger for bilinguals with high proficiency in both languages.

Method

Participants

Subjects signed up for the study on Langara's SONA System and received course credit in exchange for their participation. A total of 45 people participated in our study: 31 Punjabi speakers and 14 Mandarin speakers. All subjects were attending college in English and living in an English-speaking country at the time of participation. We ran separate sessions for speakers of each language and specified that subjects must be able to read and write in the relevant language, in addition to English, in order to participate. In order to prevent expectancy effects, our recruitment information stated that the study would investigate the effects of language context on visual learning. Our sample included 15 males and 28 females and had a mean age of 20 (M = 19.89).

Materials

Passages and recall test. The passages were taken from a study by Marian & Fausey (2006) of Spanish-English bilinguals. The style of the passages imitated academic information such as students might encounter in textbooks, but the content was fictional in order to prevent an advantage of previous knowledge on the topic. We used two passages, one containing a story about the history of a conflict between two fictional countries, and one containing information about the biology and ecosystem of a fictional island. The passages were translated into Punjabi and Mandarin by researchers on our team fluent in each of the languages. These can be found in Appendix A. Because the written form of Mandarin is not phonetic, fictional place names were written in the Latin alphabet for this translation. The recall test for information from the passages was also taken from Marian & Fausey (2006) but, as we administered the test in written form rather than verbal, some of the questions had to be changed so that they did not give away the answers to other questions on the test. The test contained 24 questions, 12 regarding each passage. Each question was worth one point, therefore the maximum possible score was 24. Partial marks were awarded for partially correct answers. All participants completed the test in English, and it can be found in Appendix B along with an answer key.

Bilingual Language Profile (BLP). Participants completed this self-report measure of language dominance for bilinguals, which can be found in Appendix C. The BLP (Birdsong, Gertken, & Amengual, 2012) yields a dominance score indicating the subject's relative ability in each of their two languages. A score close to zero indicates balanced ability in both languages, a positive score indicates English dominance, and a negative score indicates dominance in their other language (Punjabi or Mandarin). The BLP contains four sections: language history, language use, proficiency, and language attitudes. We eliminated the language use section from our analyses, as the majority of participants filled it out incorrectly. The percentages of use of each language should add up to 100 for each question

in this section, but that was not the case for most of the filled-out questionnaires. In order to divide participants into balanced and unbalanced bilinguals, we calculated the average dominance for our sample and divided at this point, with participants whose scores were closer to zero than the average forming the balanced group.

Procedure

Participants at each session were randomly assigned to the language match or mismatch condition. In the match condition, participants read the passages in English and completed the recall test in English; in the mismatch condition, participants read the passages in their native language (Punjabi or Mandarin) and completed the recall test in English. The match group had 23 participants, with 8 Mandarin and 15 Punjabi speakers; the mismatch group had 22 participants, with 6 Mandarin and 16 Punjabi speakers. After completing their consent forms, participants were given a maximum of 10 minutes to read the passages, and the passages were not taken away until everyone in the session was done reading or the time limit was reached. After reading, all participants were given a piece of origami paper and told to follow along with a short instructional video. The video (https://youtu.be/Ux1ECrNDZl4) was six minutes long and contained step-by-step instructions on how to make an origami crane. As the instructions moved very quickly, most participants were not able to complete the task. Though participants believed this to be part of the study, the video was a distraction task to allow some time between the reading of the passages and completion of the recall test. The test was given to participants immediately after the video. They were given a maximum of 15 minutes to complete the test, and it was taken away from them as soon as they had completed it. Next, they completed the BLP, after which they were debriefed and released. Informed consent and debrief can be found in Appendix D.

Results

The match and mismatch groups had equivalent BLP scores: the average dominance level of their primary language was 45.19 for the match group and 45.37 for the mismatch group. The average primary language dominance level for all participants was 45.27, which was used as the point of division for grouping the balanced and unbalanced bilinguals. There was a difference between the language dominance scores of speakers of each language: the average dominance level was 42.18 for Punjabi speakers and 52.13 for Mandarin speakers.

Multiple two-tailed independent samples t-tests were conducted to compare recall scores in the match and mismatch conditions for different portions of the data. For the data as a whole, there was not a significant difference between the match (M = 15.35) and mismatch (M = 12.86) conditions (see Figure 1); $t(43) = 2.02$, $p = 0.06$. This difference was significant for a one-tailed t-test at $p = 0.03$. For the balanced bilinguals, there was not a significant difference between the match (M = 15.75) and mismatch (M = 12.68) conditions; $t(19) = 1.42$, $p = 0.17$. There was also no significant difference between match (M = 15.05) and mismatch (M = 12.75) conditions for the unbalanced bilinguals; $t(21) = 1.41$, $p = 0.17$. See Figure 2 for comparison. For the native Punjabi speakers, there was a significant difference between the match (M = 16.27) and mismatch (M = 12.69) conditions; $t(29) = 2.34$, $p = 0.03$. For the native Mandarin speakers, there was not a significant difference between the match (M = 13.63) and mismatch (M = 13.33) conditions; $t(12) = 0.12$, $p = 0.90$. See Figure 3 for comparison.

Discussion

We predicted a significant difference overall between match and mismatch conditions and a stronger effect for the balanced bilinguals. This hypothesis was not supported. We were unable to reject the null for our data as a whole, and the difference between groups for the balanced bilinguals was no closer to significance than that for the unbalanced bilinguals. The

only result that was significant for a two-tailed t-test was the Punjabi students: there was a difference between the match and mismatch conditions in this group. By contrast, the Mandarin students' mean recall scores were nearly identical for each condition.

Implications

We set out to investigate the situation faced by foreign language students here in Canada and whether it would help or hinder students struggling to learn material in English to translate this material into their native language. Our results indicate that the wisdom of this may vary depending on the native language of the student. As we did not include a condition where participants read the passages in both languages, we cannot speak to the effects of translating material in addition to reading it in English. The difference in our findings between the Punjabi and Mandarin speaking subjects suggests that there may be some relevant cultural or linguistic factors that influence the way information is encoded and retrieved. As previous research has focussed on only one language at a time, it is unclear what factors may be responsible for this difference. While there was a difference in levels of language dominance between speakers of each language in our sample, and this could have impacted our results, it is uncertain to what degree this reflects an actual difference in language ability between the groups as opposed to cultural differences in their reporting of their own proficiency. The BLP is a self-report measure with questions requiring the subject to estimate their own proficiency and report the age at which they became comfortable using each of the languages they speak. Cultural norms regarding expressions of confidence may influence answers to questions such as these.

Relationship to Previous Research

While the results of our Punjabi subjects were in line with previous research, the rest of our findings were not. We did not find a difference in effect based on relative language proficiency and found no effect whatsoever among our Mandarin speaking subjects. One

possible reason for the lack of proficiency-based variation may be our participants. It is possible that not enough of our participants were sufficiently balanced bilinguals to experience the effects of language-dependent memory, as very few had dominance scores close to zero.

One potentially relevant difference between this study and the study of Spanish-English bilinguals by Marian & Fausey (2006) is that, while their study was oral, ours focussed on written encoding and retrieval. Their subjects listened to recordings of the passages in headphones and responded verbally to recall questions, while ours read written versions of the passages and completed a written recall test. It is possible that there are differences in the mechanisms of encoding and retrieving auditory versus visual linguistic information.

Previous research with Mandarin-English bilinguals by Marian & Kaushanskaya (2007) indicates that while match or mismatch of encoding and retrieval language does have an effect on recall, encoding in native language versus non-native language does as well. In fact, in this study, the advantage of encoding in the participant's native language was greater than the encoding-retrieval match advantage. As we only tested recall in English, it may be that the advantage to students encoding in their native language balanced out the advantage of those in the match condition, who were encoding in their non-native language. However, it is unclear why this would impact the Mandarin students more than the Punjabi students.

Studies of autobiographical memory are less easy to compare to our research, as the questions asked tend to be more open and accuracy of recall is not measured. These studies focus on the number of memories recalled in each language and the amount of detail reported (Marian & Neisser, 2000; Marsh, Kanaya, & Pezdek, 2015; Mortensen, Berntsen, & Bohn, 2015). While this open style of associative recall reveals interesting language biases, it is very different to the narrow recall of specific information that was examined in our study.

Limitations

Differences between the results of Mandarin and Punjabi students may be due to linguistic or cultural differences, or may be due to limitations of the current study. As Mandarin is not written phonetically, the names of invented things (such as places and plants) in the Mandarin passages were written in English characters while this was not the case for the Punjabi passages. This may have had some effect, although only 4 of the 24 questions required participants to recall these invented names. Our sample of Mandarin students was very small, making it difficult to draw conclusions about this group. We also noticed that the Mandarin students were more engaged with our distraction task but, as the mean recall test scores were very similar for Punjabi (M = 14.42) and Mandarin students (M = 13.5), it is difficult to say whether this had an impact. Finally, we had to eliminate a section of the BLP from our results, as the majority of participants did not fill it out correctly. It is possible that this had an impact on our ability to accurately separate the balanced bilinguals from the unbalanced bilinguals.

Future Research

Future research into language-dependent memory could examine languages separately or set out to compare speakers of different languages, as our study indicates there may be very different results depending on the languages spoken. As the research on this topic up until now has only investigated a small fraction of the possible languages bilingual people speak around the world, there is a great deal of additional research that could be done. Future research should be sure to examine recall and encoding in participants' native and non-native languages to control for native language advantages. While our results did not support our

hypothesis, the variation we found between speakers of different languages adds to the previous literature and suggests interesting new research possibilities.

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Appendix A

Passages: English, Punjabi, and Mandarin

Passage #1: HISTORY

In the 32nd century many different groups of people lived on a faraway continent. Two of the countries on this continent were Mepa and Cuni and these countries were separated by a long and deep valley. This valley was the deepest valley in the whole continent. The midpoint of this valley was called the Zone of Siboma. This zone was a large trading center and many people from each country passed through it every day. This zone was very important to each country because many of their citizens worked there and earned a lot of money for their families. However, at the end of the century, an earthquake destroyed most of the Zone of Siboma. This earthquake destroyed almost all of the areas where people worked and many people lost their jobs. The unemployed citizens of each country pressured their governments to improve the situation. The leader of Mepa wanted both countries to work together to rebuild the zone. If they worked together, they could rebuild faster. However, the Cuni government did not want to work together because they wanted to gain total control of the area. The Cuni leader therefore ordered the Mepas to completely withdraw from the Zone of Siboma, to remove all of their workers, or else, they would attack with military force. The Mepas did not withdraw and decided to fight for their country. Thus, the War of Siboma began and the Mepas fought to protect their parts of the zone. This war lasted two years. It ended when the leader of Mepa was assassinated by two Mepa traitors who were paid off by the Cuni government and the Cunis won the war. After the war, the entire Zone of Siboma became part of their country. The zone was controlled by the Cunis and Mepa has suffered economically ever since.

Passage #2: BIOLOGY

The following story is about some rare types of plants. On the island Fimo, certain plants grow only during its special hot season. The plants grow because of a special combination of soil and rain that are found only on Fimo. The people of Fimo know their plants well

because some are deadly but some are very good sources of nutrients. For example, a very popular dessert, in fact, the national dessert, is made from a plant called Mugal. Mugal plants are healthy and safe. Another plant, which looks very similar to a Mugal, however, is dangerous. This plant causes severe headaches that lead to death in people who touch it. Therefore, it is very important for the people of Fimo to understand the specific differences among their special plants. There are some simple rules to help them learn the safe plants and the dangerous plants. First, the plants that grow during the hot season are all flowered. None of the other plants that grow year-round on the island have flowers. So, you only need to worry about plants with flowers. Second, you need to look at the leaves of plants. Plants with spiny leaves are all safe. Nothing else matters about the plants with spiny leaves. Spiny leaves signal a safe plant. The third rule is the most important and called the rule of colour. This rule applies only to plants whose leaves are smooth. Some plants with smooth leaves are safe but some are dangerous. On the smooth-leaved plants, it is important to notice the colour of the flowers. A smooth plant is safe to eat if it has white or yellow flowers. These colours are valued on the island Fimo because plants with these colours are used in many foods and drinks. The colours are so valued that even the Fimo flag is white and yellow. The important Mugal plants have smooth leaves and white flowers. Mugal is used in the national dessert of Fimo. Plants that have smooth leaves and blue flowers are very dangerous. Plants with blue flowers should never be eaten because they cause vomiting. People who live on Fimo know they must pay attention to the leaves and flowers of the plants during the hot season. They know the rules very well, enjoy what their special plants offer them, and remain safe from the deadly plants.

ਇਤਿਹਾਸ (history)

੩੨ ਵੀ ਸਦੀ ਵਿਚ ਬਹੁਤ ਸਾਰੇ ਲੋਕ ਇੱਕ ਦੂਰ ਵਸੇ ਮਹਾਂਦੀਪ ਤੇ ਰਹਿੰਦੇ ਸਨ |ਇਸ ਮਹਾਂਦੀਪ ਤੇ ਦੋ ਦੇਸ਼ ਵਸਦੇ ਸੀ - ਮੇਪਾ ਅਤੇ ਸੁੰਨੀ ਅਤੇ ਇਹ ਦੋੱਨੇ ਦੇਸ਼ ਇੱਕ ਲੰਬੀ ਵਾਦੀ(ਵੈਲੀ) ਦੁਆਰਾ ਵੱਖ ਹੁੰਦੇ ਸਨ | ਇਹ ਵਾਧੀ (ਵੈਲੀ) ਪੂਰੇ ਮਹਾਂਦੀਪ ਵਿਚ ਸਬ ਤੋਂ

ਡੂੰਗੀ ਵਾਦੀ ਸੀ | ਇਸ ਵਾਦੀ ਦੇ ਵਿਚਕਾਰ ਨੂੰ "ਸਿਬੋਮਾ ਦਾ ਜ਼ੋਨ " ਕਿਹਾ ਜਾਂਦਾ ਸੀ | ਇਹ ਜ਼ੋਨ ਬਹੁਤ ਹੀ ਮਹੱਤਪੂਰਨ ਸੀ ਦੋਨੇ ਦੇਸ਼ਾ ਲਈ ਕਿਉਂਕਿ ਬਹੁਤ ਸਾਰੇ ਨਾਗਰਿਕ ਉਥੇ ਕੰਮ ਕਰਦੇ ਸਨ ਅਤੇ ਆਪਣੇ ਪਰਿਵਾਰਾ ਲਈ ਪੈਸੇ ਕਮਾਉਂਦੇ ਸਨ ,ਪਰ ਸਦੀ ਦੇ ਅੰਤ ਵਿਚ ਇਕ ਭੁਚਾਲ ਕਾਰਨ ਸਾਰੀ ਜ਼ੋਨ ਬਰਬਾਦ ਹੋ ਗਈ | ਇਸ ਭੁਚਾਲ ਨੇ ਸਾਰੇ ਕੰਮਾਂ ਵਾਲੇ ਜਗ੍ਹਾਵਾਂ ਨੂੰ ਨਸ਼ਟ ਕਰ ਦਿੱਤਾ ਜਿਸ ਵਜਾਹ ਨਾਲ ਲੋਕੀ ਆਪਣੀਆਂ ਨੌਕਰੀਆਂ ਤੋਂ ਵੀ ਹੱਥ ਧੋ ਬੈਠੇ | ਬੇਰੋਜ਼ਗਾਰ ਨਾਗਰਿਕ ਦੇਸ਼ ਦੀ ਸਰਕਾਰ ਤੇ ਹਾਲਤ ਸੁਧਾਰਨ ਲਈ ਜ਼ੋਰ ਪਾਉਣ ਲੱਗ ਪਏ | ਮੇਪਾ ਦੇਸ਼ ਦਾ ਨੇਤਾ ਚਾਹੁੰਦਾ ਸੀ ਕਿ ਦੋਨੇ ਦੇਸ਼ ਮਿਲ ਕੇ ਦੁਬਾਰਾ ਜ਼ੋਨ ਦੀ ਸਥਾਪਨਾ ਕਰੇ ਤਾ ਕਿ ਉਹ ਛੇਤੀ ਤੋਂ ਛੇਤੀ ਉਸ ਜ਼ੋਨ ਦੀ ਬੁਨਿਆਦ ਕਰ ਸਕਣ | ਪਰ ਇਹ ਗੱਲ ਸੁੰਨੀ ਦੀ ਸਰਕਾਰ ਨੂੰ ਪਸੰਦ ਨਹੀਂ ਸੀ ਕਿਉਕਿ ਉਹ ਸਾਰੀ ਤਾਕਤ ਇਕੱਲੇ ਆਪਣੇ ਕੋਲ ਚਾਹੰਦੇ ਸਨ | ਇਸ ਲਈ ਸੁੰਨੀ ਦੇ ਨੇਤਾ ਨੇ ਮੇਪਾ ਦੇ ਨਾਗਰਿਕਾ ਨੂੰ ਆਪਣੇ ਕਰਮਚਾਰੀਆਂ ਨੂੰ ਹਟਾਉਣ ਦੀ ਚੇਤਾਵਨੀ ਦਿੱਤੀ ਅਤੇ ਜੇ ਉਹ ਨਹੀਂ ਮੰਨੇ ਤਾਂ ਫੌਜੀ ਹਮਲੇ ਦੀ ਧਮਕੀ ਦਿੱਤੀ | ਮੇਪਾ ਦੇ ਨਾਗਰਿਕਾ ਨੇ ਹਿੰਮਤ ਨਹੀਂ ਹਾਰੀ ਤੇ ਹਮਲੇ ਦਾ ਡੱਟ ਕੇ ਮੁਕਾਬਲਾ ਕੀਤਾ ਅਤੇ ਇਹ ਸਿਬੋਮਾ ਦੀ ਜੰਗ ਦੋ ਸਾਲ ਤਕ ਚੱਲੀ , ਪਰ ਅੰਤ ਵਿਚ ਮੇਪਾ ਦੇ ਨੇਤਾ ਦਾ ਕਤਲ ਕਰ ਦਿੱਤਾ ਗਿਆ ਉਹ ਵੀ ਦੋ ਮੇਪਾ ਦੇ ਧੋਖੇਦਾਰਾਂ ਦੇ ਹੱਥੋਂ ਕਿਉਕਿ ਊਨਾ ਦੋਨਾਂ ਕਾਤਲਾਂ ਨੇ ਸੁੰਨੀ ਦੀ ਸਰਕਾਰ ਤੋਂ ਪੈਸੇ ਖਾਦੇ ਸਨ | ਇਸ ਹਾਦਸੇ ਤੋਂ ਬਾਅਦ ਸੁੰਨੀ ਦੇਸ਼ ਜੰਗ ਜਿੱਤ ਗਿਆ ਅਤੇ ਸਾਰਾ ਜ਼ੋਨ ਊਨਾ ਦੇ ਦੇਸ਼ ਦਾ ਭਾਗ ਬਣ ਗਿਆ ਅਤੇ ਮੇਪਾ ਦੇ ਨਾਗਰਿਕ ਅੱਜ ਤਕ ਆਰਥਿਕ ਤੰਗੀਆਂ ਦਾ ਸਾਹਮਣਾ ਕਰ ਰਹੇ ਹਨ |

ਜੀਵ ਵਿਗਿਆਨ (Biology)

ਇਹ ਕਹਾਣੀ ਬਹੁਤ ਅਨੇਖੇ ਪੌਦਿਆਂ ਦੀ ਹੈ |ਫਾਇਮੋ ਟਾਪੂ ਤੇ ਕੁਝ ਪੌਦੇ ਗਰਮੀ ਦੇ ਮੌਸਮ ਵਿਚ ਹੀ ਉੱਗਦੇ ਸਨ | ਇਹ ਪੌਦੇ ਫਾਇਮੋ ਟਾਪੂ ਦੀ ਅਨੇਖੀ ਰੇਤ ਤੇ ਬਾਰਿਸ਼ ਕਰਕੇ ਹੀ ਉੱਗਦੇ ਸਨ | ਇਥੋਂ ਦੇ ਲੋਕ ਇਨ੍ਹਾਂ ਪੌਦਿਆਂ ਨੂੰ ਚੰਗੀ ਤਰ੍ਹਾਂ ਜਾਣਦੇ ਹਨ ਕਿਉਕਿ ਕੁਝ ਪੌਦੇ ਬਹੁਤ ਹੀ ਜ਼ਹਿਰੀਲੇ ਨੇ ਤੇ ਕੁਝ ਬਹੁਤ ਹੀ ਪੌਸ਼ਟਿਕ ਹਨ |ਜਿਵੇਂ ਕਿ, ਇੱਕ ਬਹੁਤ ਮਸ਼ਹੂਰ ਮਿਠਾਈ ,ਅਸਲ ਵਿਚ , ਕੈਮੀ ਮਿਠਾਈ ਮੁਗ਼ਲ ਨਾਮ ਦੇ ਪੌਦੇ ਤੋਂ ਬਣਦੀ ਹੈ | ਇਹ ਪੌਦੇ ਖਾਣ ਵਾਸਤੇ ਸੁਰੱਖਿਅਤ ਤੇ ਤੰਦਰੁਸਤ ਹੈ | ਇੱਕ ਹੋਰ ਪੌਦਾ

ਜੋ ਕਿ ਵੇਖਣ ਨੂੰ ਲਗਭਗ ਮੁਗ਼ਲ ਵਰਗਾ ਹੀ ਹੈ , ਪਰ ਉਹ ਪੌਦੇ ਨੂੰ ਛੂਹਣ ਨਾਲ ਆਦਮੀ ਦੇ ਸਿਰਦਰਦ ਹੋਣ ਲਗ ਪੈਂਦਾ ਹੈ ਤੇ ਫਿਰ ਇਹ ਸਿਰਦਰਦ ਆਦਮੀ ਦੀ ਜਾਨ ਵੀ ਲੈ ਲੈਂਦਾ ਹੈ | ਇਸ ਕਰਕੇ ਇਹ ਫਾਇਮੇ ਦੇ ਵਸਨੀਕ ਵਾਸਤੇ ਬਹੁਤ ਜਰੂਰੀ ਹੈ ਕਿ ਉਹ ਇਨ੍ਹਾਂ ਪੌਦਿਆਂ ਦੀ ਚੰਗੀ ਤਰ੍ਹਾਂ ਪਹਿਚਾਣ ਕਰਨ ਅਤੇ ਪਹਿਚਾਨਣ ਦਾ ਇਕ ਬਹੁਤ ਹੀ ਸੌਖਾ ਤਰੀਕਾ ਵਸਨੀਕ ਵਾਸਤੇ ਹੈ ਕਿ ਉਨ੍ਹਾਂ ਨੂੰ ਪਤਾ ਹੋਵੇ ਕਿ ਜਿਹੜੇ ਪੌਦੇ ਗਰਮੀਆਂ ਵਿਚ ਉੱਗਦੇ ਨੇ ਉਨ੍ਹਾਂ ਦੇ ਫੁੱਲ ਹੁੰਦੇ ਨੇ ਬਾਕੀ ਕਿਸੇ ਵੀ ਪੌਦਿਆਂ ਦੇ ਫੁੱਲ ਨਹੀਂ ਹੁੰਦੇ ਅਤੇ ਉਨ੍ਹਾਂ ਨੂੰ ਬਸ ਬਾਕੀ ਫੁੱਲਾਂ ਵਾਲੇ ਪੌਦੇ ਪੂਰੇ ਸਾਲ ਵਿਚ ਉੱਗਣ ਵਾਲਿਆਂ ਤੋਂ ਹੀ ਸਾਵਧਾਨ ਰਹਿਣ ਦੀ ਲੋੜ ਹੈ |ਦੂਸਰਾ ਨਿਯਮ ਹੈ ਕਿ ਜਿਹੜੇ ਪੌਦੇ ਸਪਿਨ ਪੱਤੇ ਵਾਲੇ ਹੁੰਦੇ ਨੇ ਉਹ ਵੀ ਹਾਨੀਕਾਰਕ ਨਹੀਂ ਹੁੰਦੇ | ਤੀਸਰਾ ਨਿਯਮ ਸਭ ਤੋਂ ਮਹੱਤਪੂਰਨ ਹੈ ਕਿਉਕਿ ਇਸ ਨੂੰ ਰੰਗ ਦਾ ਨਿਯਮ ਕਹਿੰਦੇ ਨੇ ਕਿਉਕਿ ਇਸ ਵਿਚ ਪੌਦੇ ਦੇ ਰੰਗ ਤੋਂ ਉਸ ਬਾਰੇ ਪਤਾ ਚਲ ਜਾਂਦਾ ਹੈ , ਪਰ ਇਹ ਬਸ ਉਨ੍ਹਾਂ ਪੌਦਿਆਂ ਵਾਸਤੇ ਹੈ ਜਿਨ੍ਹਾਂ ਦੇ ਮੁਲਾਇਮ ਪੱਤੇ ਹਨ | ਮੁਲਾਇਮ ਪੱਤਿਆਂ ਵਾਲਾ ਪੌਦਾ ਜਿਨ੍ਹਾਂ ਦੇ ਚਿੱਟੇ ਤੇ ਪੀਲੇ ਫੁੱਲ ਹੋਣ ਉਹ ਖਾਣ ਵਾਸਤੇ ਹਾਨੀਕਾਰਕ ਨਹੀਂ ਹਨ | ਇਹ ਪੌਦੇ ਬਹੁਤ ਸਾਰੇ ਪਕਵਾਨਾਂ ਅਤੇ ਪੀਣ ਵਾਲੇ ਪਦਾਰਥਾਂ ਵਿਚ ਵਰਤੇ ਜਾਂਦੇ ਹਨ | ਇਹ ਦੋ ਰੰਗਾਂ ਦੀ ਇੰਨ੍ਹੀ ਮਹੱਤਤਾ ਹੈ ਫਾਇਮੇ ਵਿਚ ਕਿ ਉਥੇ ਦਾ ਝੰਡਾ ਵੀ ਚਿੱਟੇ ਅਤੇ ਪੀਲੇ ਰੰਗ ਦਾ ਹੈ | ਮੁਗ਼ਲ ਦੇ ਜਰੂਰੀ ਪੌਦਿਆਂ ਦੇ ਮੁਲਾਇਮ ਪੱਤੇ ਅਤੇ ਚਿੱਟੇ ਫੁੱਲ ਹੁੰਦੇ ਹਨ | ਮੁਗ਼ਲ ਉਥੇ ਦੇ ਰਾਸ਼ਟਰੀ ਮਿਠਾਈ ਵਿੱਚ ਵੀ ਵਰਤਿਆ ਜਾਂਦਾ ਹੈ | ਮੁਲਾਇਮ ਪੱਤੇ ਅਤੇ ਨੀਲੇ ਫੁੱਲਾਂ ਵਾਲੇ ਪੌਦੇ ਬਹੁਤ ਹੀ ਖ਼ਤਰਨਾਕ ਹੁੰਦੇ ਹਨ | ਨੀਲੇ ਫੁੱਲਾਂ ਵਾਲੇ ਪੌਦੇ ਖਾਣ ਨਾਲ ਆਦਮੀ ਨੂੰ ਉਲਟੀਆਂ ਵੀ ਲਗ ਸਕਦੀਆਂ ਹਨ | ਫਾਇਮੇ ਤੇ ਰਹਿਣ ਵਾਲੇ ਲੋਕ ਗਰਮੀਆਂ ਵਿੱਚ ਉੱਗਣ ਵਾਲੇ ਪੱਤਿਆਂ ਤੇ ਫੁੱਲਾਂ ਤੇ ਖਾਸ ਧਿਆਨ ਦਿੰਦੇ ਹਨ | ਉਹ ਨਿਯਮਾਂ ਨੂੰ ਬਹੁਤ ਚੰਗੀ ਤਰ੍ਹਾਂ ਜਾਣਦੇ ਹਨ ਤੇ ਉਨ੍ਹਾਂ ਦਾ ਆਨੰਦ ਮਾਣਦੇ ਹਨ ਜੋ ਉਨ੍ਹਾਂ ਦੇ ਪੌਦੇ ਉਨ੍ਹਾਂ ਨੂੰ ਪੇਸ਼ ਕਰਦੇ ਹਨ |

历史小故事(history passage)
在第32世纪，在一个遥远的陆地上住着许多居民。 这片陆地上有Mepa和Cuni这两个国家，这两个国家之间相隔了一道幽深狭长的山谷。这是一道陆地上最深的山谷。在山谷的中间有一个叫Siboma的地方，那是一个大集市，两个国家的许多居民每天都会经过这里。因为许多人在这里工作，赚钱养家，所以这个地方对两个国家来说都非常重要。然而，在世纪末，一场地震几乎摧毁了整个Siboma 地区。人们工作的地方差不多都被毁坏，许多人因此失业。失业者们向各自的政府施压，要求解决问题。Mepa的领袖提出两国合作，共同出力以尽快重建这个地方。然而Cuni的政府不愿意，他们想独占这个地方，因此他们命令所有的Mepa人都离开Siboma，否则就要动用武力。Mepa人不愿妥协并决定要一战到底保卫自己的国家。就这样，Siboma之战打响了，Mepa人为了保住他们在Siboma的领地不断战斗着。这场战争持续了两年，一直到Mepa的领袖被暗杀才结

束。Mepa 的领袖死于两个被Cuni政府用金钱收买的Mepa叛徒之手。Cuni 赢了这场战争。战后，整个Siboma 地区被Cuni占领掌控，从此Mepa国的经济一蹶不振。

生物小故事(biology passage)

下面的故事是关于几种稀有植物的。在一个名为Fimo的岛上，有些植物只有在特别炎热的季节才会生长。这些植物的生长也离不开岛上独一无二的土壤和雨水环境。Fimo岛的居民非常了解他们岛上的植物: 有一些植物是致命的，而有一些具有很高的营养价值。例如，这个小岛上有一种很流行的甜品，（甚至是整个国家甜品的代言），就是由一种叫Mugal的植物制成的。这种植物对人类健康无害。但是，岛上的另一种植物和Mugal长相相近，对人类却有致命的危险，凡是接触到它的人都会头痛欲裂而导致死亡。 因此，能够区分这些不同的植物对岛民来说非常重要。有一些简单的方法可以帮助岛民们判断植物究竟安全还是有害。第一，在炎热的季节生长的植物都会开花，而岛上其他常年生长的植物都不开花。所以你只需要小心那些会开花的植物。第二，你需要观察植物的叶子。长有针刺状叶子的植物都是安全的。第三点最重要，被称为颜色法则，这一法则只适用于判断长有平滑叶子的植物。长有平滑叶子的植物，有的有毒，有的无毒，因此观察它们花朵的颜色就非常重要。凡是开白色或黄色花朵的都是可食用的。这些植物经常被用来制成各种食品和饮料，因此白色和黄色对Fimo岛意义重大，甚至连那里的岛旗都是由白色和黄色组成的。上文所提到的用来制重要甜品的植物， Mugal，就长有平滑的叶子并且开白色的花朵。然而，长有平滑叶子且开蓝色花朵的植物却非常危险，绝不可食，误食之后会导致严重呕吐。Fimo岛的居民们知道他们得注意观察在炎热季节生长的植物的叶子和花朵。他们很了解辨别植物的方法，享受着那些特殊的植物带给他们的好处，并能避开那些有毒的植物给他们带来的伤害。

Appendix B

Recall Test with Answer Key

Passage #1

1) In the war between two countries, the leader of what country was killed?

2) What is the name of the midpoint of the valley between the two countries?

3) In the story about fighting over territory, what geological feature separated two countries?

4) What did citizens of each country do at the Zone of Siboma?

5) What did the leader of Mepa want the other country to do after the earthquake?

6) How did the Zone of Siboma change after the war?

7) How has the country that lost the war suffered?

8) In the story about fighting over territory, what natural disaster sparked a conflict about an important area between two countries?

9) What happened to citizens of the two countries after the earthquake that made them pressure their governments?

10) After the earthquake, why did the Cuni government not help the Mepas rebuild the destroyed area?

11) What did the Cuni leader order the Mepa government to do?

12) How was the leader of Mepa killed?

Passage #2

1) What is the name of the island where rare types of plants grow for part of the year?

2) What is the name of the plant that is safe and used in the national dessert of the island?

3) Why do rare types of plants grow on this island, and nowhere else on Earth, during its hot season?

4) To distinguish safe plants from dangerous plants on this island, what two parts of plants do you need to look at?

5) Certain plants are always safe, regardless of the colour of their flowers. What type of plants are these?

6) Why is the island flag white and yellow?

7) What is a non-fatal sickness caused by dangerous plants on the island?

8) In the story about some rare plants on an island, why must the people of that island understand differences among their special plants?

9) A dangerous plant looks similar to the Mugal. What does this dangerous plant cause?

10) What part of a plant lets the people of the island know whether it grows in the hot season or not?

11) On what type of plants is the colour of flowers important to notice?

12) What colour flower signals a dangerous plant on the island?

Answer Key: Passage #1

1; Mepas 2; Zone of Siboma 3; valley 4; work & trade 5; work together to rebuild the region 6; the Zone of Siboma was taken over by the Cuni government 7; the country lost all their jobs and suffered economically 8; earthquake 9; they lost their jobs 10; Cuni government wanted to take over the Zone of Siboma 11; retreat 12; assassinated

Answer Key: Passage #2

1; Fimo 2; Mugal 3; special combination of soil and rain 4; flowers and leaves 5; plants with spiny leaves 6; because only plants with white or yellow flowers are safe to eat/plants of this color are used in many foods and drinks 7; vomiting 8; because some are deadly and some are good to eat 9; severe headaches that lead to death 10; whether the plant has flower or not 11; plants with smooth leaves 12; any color other than yellow and white

Appendix C

Bilingual Language Profile Template

Bilingual Language Profile: English-Language

We would like to ask you to help us by answering the following questions concerning your language history, use, attitudes, and proficiency. This survey was created with support from the Center for Open Educational Resources and Language Learning at the University of Texas at Austin to better understand the profiles of bilingual speakers in diverse settings with diverse backgrounds. The survey consists of 19 questions and will take less than 10 minutes to complete. This is not a test, so there are no right or wrong answers. Please answer every question and give your answers sincerely. Thank you very much for your help.

I. Biographical Information

Age_____ Male / Female / Other How many hours did you sleep last night? _____

What time did you wake up? _____

Please cite as :
Birdsong, D., Gertken, L.M., & Amengual, M. *Bilingual Language Profile: An Easy-to-Use Instrument to Assess Bilingualism.* COERLL, University of Texas at Austin. Web. 20 Jan. 2012. <https://sites.la.utexas.edu/bilingual/>.

II. Language history

In this section, we would like you to answer some factual questions about your language history by placing a check in the appropriate box.

1. At what age did you **start learning** the following languages?

English

Since birth 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

Language

Since birth 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

2. At what age did you **start to feel comfortable** using the following languages?

English

As early as I can remember 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+ not yet

Language

As early as I can remember 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+ not yet

3. How many years of **classes (grammar, history, math, etc.)** have you had in the following languages (primary school through university)?

English

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

Language

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

4. How many years have you spent in a **country/region** where the following languages are spoken?

English

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

Language

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

5. How many years have you spent in a **family** where the following languages are spoken?

English

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

Language

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

6. How many years have you spent in a **work environment** where the following languages are spoken?

English

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

Language

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20+

III. Language use

In this section, we would like you to answer some questions about your language use by placing a check in the appropriate box. Total use for all languages in a given question should equal 100%.

7. In an average week, what percentage of the time do you use the following languages **with friends**?

English

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Language

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Other languages

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

8. In an average week, what percentage of the time do you use the following languages **with family**?

English

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Language

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Other languages

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

9. In an average week, what percentage of the time do you use the following languages **at school/work**?

English

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Language

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Other languages

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

10. When you talk to yourself, how often do you **talk to yourself** in the following languages?

English

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Language

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Other languages

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

11. When you count, how often do you **count** in the following languages?

English

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Language

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Other languages

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

IV. Language proficiency

In this section, we would like you to rate your language proficiency by giving marks from 0 to 6.

0=not well at all *6=very well*

12. a. How well do you speak **English**? 0 1 2 3 4 5 6

    b. How well do you speak **Language**? 0 1 2 3 4 5 6

13. a. How well do you understand **English**? 0 1 2 3 4 5 6

    b. How well do you understand **Language**? 0 1 2 3 4 5 6

14. a. How well do you read **English**? 0 1 2 3 4 5 6

    b. How well do you read **Language**? 0 1 2 3 4 5 6

15. a. How well do you write **English**? 0 1 2 3 4 5 6

    b. How well do you write **Language**? 0 1 2 3 4 5 6

V. Language attitudes

In this section, we would like you to respond to statements about language attitudes by giving marks from 0-6.

0=disagree *6=agree*

16. a. I feel like myself when I speak **English**.

0 1 2 3 4 5 6

b. I feel like myself when I speak **Language**. 0 1 2 3 4 5 6

17. a. I identify with an **English-speaking** culture.

0 1 2 3 4 5 6

b. I identify with a **Language -speaking** culture.

0 1 2 3 4 5 6

18. a. It is important to me to use (or eventually use) **English** like a native speaker.

0 1 2 3 4 5 6

b. It is important to me to use (or eventually use) **Language** like a native speaker.

0 1 2 3 4 5 6

19. a. I want others to think I am a native speaker of **English**.

0 1 2 3 4 5 6

b. I want others to think I am a native speaker of **Language**.

0 1 2 3 4 5 6

Appendix D

Informed Consent and Debrief

Langara College
Psychology 2320
Research Methods

Informed Consent Form

Language context and visual learning.

Student Investigators: Lindsay Alley, Dongyue Chen, Sukhvir Kaur, Elise Goulet, Steven Keful, Young Kyun Kim, Jaspreet Singh

Faculty Supervisor: Ross Woolley

This study is being conducted by students in Ross Woolley's Psychology 2320 course as part of their class requirements. You are being asked to participate in the following study.

What will I be doing?
This study examines the effect of native and foreign language on innovative skills of an individual. You will be asked to read the passage and perform the origami (paper folding) task. We anticipate that participation will take approximately 45-50 minutes. You will receive 1 SONA credit toward your psychology course for your participation.

What are the risks of participating?
There are no known risks for this study. However, some of the questions we ask might upset you. You are free not to answer any questions you feel uncomfortable answering, and you may withdraw from the study at any time without penalty. Please let the researchers know if you have any concerns.

What are the benefits of participating?
There are no personal benefits to participation. However, you will be given an opportunity to learn about this research, which may be useful to you in your course or in understanding yourself and others. In addition, you will have an opportunity to contribute to psychological science in general by participating in this research. You will additionally be given 1 SONA credit for your psychology course.

Will your information be kept confidential?
All information obtained during the study will be held in strict confidence and will be used for research purposes only. We will de-identify the data such that the research data that is collected cannot be linked to an individual's name. **No information will connect you specifically to your answers on the questionnaires.** No personal information will be collected.

Where will the results of the study be published?
The results of this study may be presented in poster sessions, as a verbal presentation, or a report may be published in a journal.

At this time we would like to remind you that if you decide to participate, you are under *no obligation* to continue to participate if for any reason you feel uncomfortable doing so. You may *withdraw at any time without penalty*.

If you have any questions or would like to hear about the results of the study, you can contact John Kim, via email at ykim40@langara.bc.ca for further information.

The research projects conducted as part of PSYC 2320 have received ethics clearance from Ross Woolley. Should you have any comments or concerns resulting from your participation in this study, please feel free to contact rwoolley@langara.bc.ca or Dr. John Russell, Chair of the Research Ethics Board, at jrussell@langara.bc.ca.

If you have questions about the study before participating, please ask them now. If you are now willing to participate, please sign this consent form which will be separated from your responses in order to maintain confidentiality and anonymity.

Thank you for your participation.

Name (please print):_____ Signature:_____

Date: _____

Langara.
THE COLLEGE OF HIGHER LEARNING.

Language context and visual learning.

Thank you for agreeing to participate in our research! In this study, you were asked to read two passages, watch a short instructional video on how to fold origami paper, and then answer some questions regarding the passages you read. Some of you read the passages in

English, and some of you read them in your native language. The true purpose of this study was to find out if ESL college students would do better on a test taken in English when they also learned the information in English than when they learned the information in their native language. We did not inform you of the true purpose because we didn't want you to focus too much on remembering the passages. The short video on origami was a distraction to keep the test from being too easy, as it might have been if taken right after reading the passages. The information in the passages was fictional so that prior knowledge would not affect the testing scores. We hope the results from this study will help bilingual students understand the interaction between language and memory, and guide them as to whether or not to translate learning material into their native language. If our hypothesis proves correct, it may be a better idea for students to focus their energy on learning the material in the language in which it is presented.

At this time I would like to remind you that you will not be identified individually in any way in any written reports of this research as all data is published as group data. Only the researchers associated with this study have access to the data. At the end of the semester, paper data will be shredded and computer data will be erased.

The research projects conducted as part of PSYC 2320 have received ethics clearance through the Langara Research Ethics Board and this project in particular was reviewed by Ross Woolley. Should you have any comments or concerns resulting from your participation in this study, please feel free to contact rwoolley@langara.bc.ca or Dr. John Russell, Chair of the Research Ethics Board, at jrussell@langara.bc.ca.

Thank you for your participation in this study. If you have further questions about the study, please contact John Kim at ykim40@langara.bc.ca

The following reference may be of interest if you wish to read more about this topic/area of research:

Marian, V., & Fausey, C. M. (2006). Language-Dependent Memory in Bilingual Learning. *Applied Cognitive Psychology, 20,* 1025–1047. http://dx.doi.org/10.1002/acp.1242

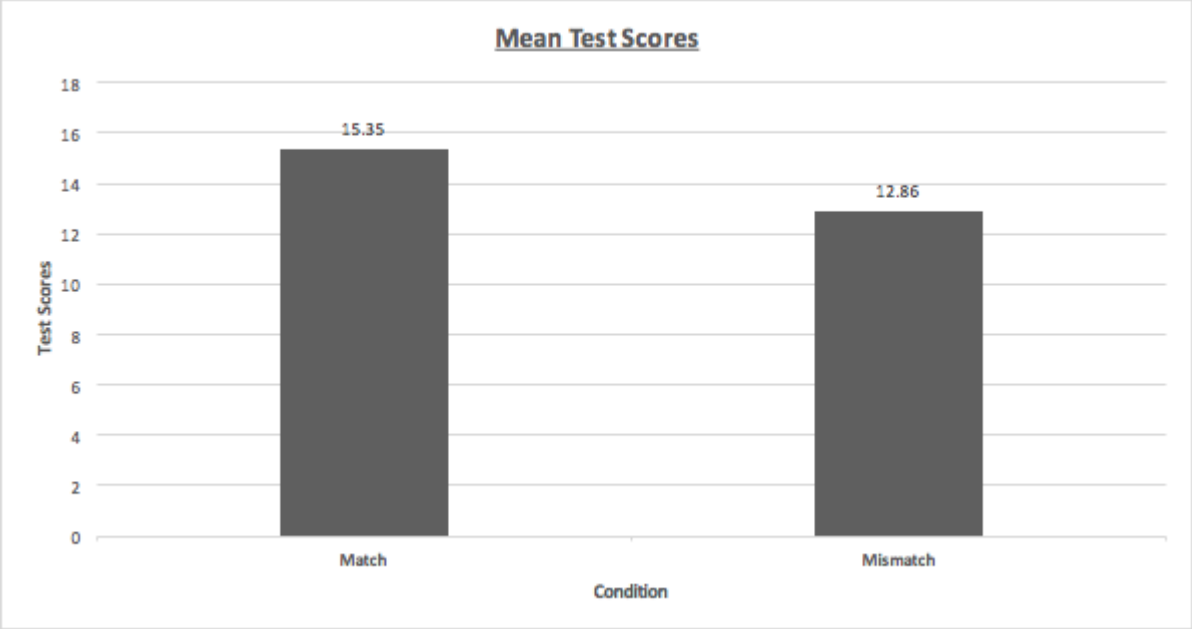

Figure 1. Comparing mean recall test scores for match and mismatch groups, all data.

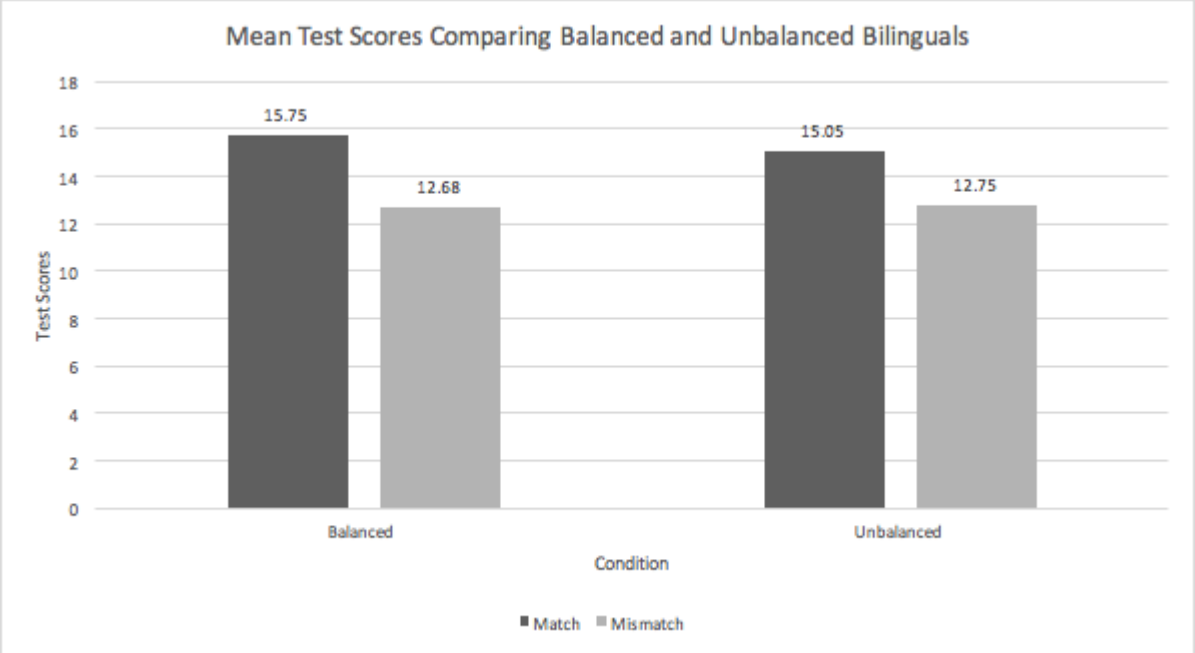

Figure 2. Comparing mean recall test scores between match and mismatch groups, with data divided into balanced and unbalanced bilingual groups.

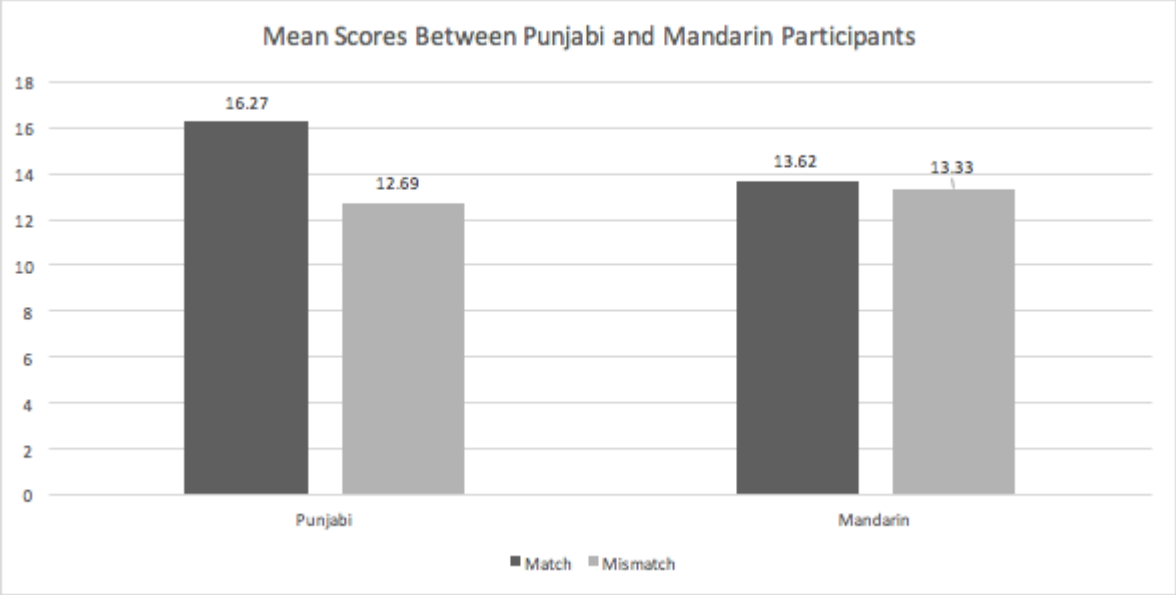

Figure 3. Comparing mean recall test scores between match and mismatch groups, with data divided into Punjabi and Mandarin speakers.