Effects of context words and pictures on bilinguals' concept selection: A study of language speech production task in the Khmer-English bilinguals

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บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อ 1) ศึกษาผลของตัวลวงที่เป็นคำและรูปภาพที่มีต่อการเรียนรู้ภาษาของบุคคลสองภาษา และ 2) เปรียบเทียบแหล่งข้อมูลที่ใช้ในการเรียนรู้ภาษาระหว่างกลุ่มที่มีความสามารถสูงกับกลุ่มที่มีความสามารถต่ำ กลุ่มตัวอย่างประกอบด้วยกลุ่มที่มีความสามารถสูงจำนวน 24 คน และกลุ่มที่มีความสามารถต่ำจำนวน 24 คน โดยแบ่งระดับความสามารถด้วยผลการทดสอบที่ได้จากแบบทดสอบความสามารถทางด้านภาษาของ Gollan, Montoya and Werner (2002) การทดลองมีชื่อว่า Language speech production ดำเนินการโดยให้ผู้เข้าร่วมการวิจัยแปลคำศัพท์จากภาษาอังกฤษเป็นภาษาเขมร คำศัพท์ที่กำหนดให้มีบริบทของตัวลวงเป็นคำหรือรูปภาพ ตัวลวงที่เป็นคำและรูปภาพนั้น มีทั้งที่มีและไม่มีความหมายสัมพันธ์กับคำศัพท์ที่กำหนดให้ ระหว่างการทดลอง ผู้วิจัยบันทึกเวลาการตอบสนอง และความถูกต้องของคำตอบ โดยใช้โปรแกรม DMDX วิเคราะห์ข้อมูลด้วยค่าเฉลี่ย ส่วนเบี่ยงเบนมาตรฐาน และ three-way ANOVA

ผลการวิจัยปรากฏว่า ผู้เข้าร่วมการวิจัยสามารถใช้เวลาการตอบสนอง ในบริบทของตัวลวงที่เป็นคำศัพท์ได้เร็วกว่าตัวลวงที่เป็นรูปภาพ นอกจากนี้พบว่าตัวลวงที่เป็นคำซึ่งมีความหมายสัมพันธ์กับคำศัพท์ที่กำหนดให้ส่งผลรบกวนการเรียนรู้ภาษา ขณะที่ตัวลวงรูปภาพที่มีความสัมพันธ์กับคำศัพท์ที่กำหนดให้ช่วยส่งเสริมการเรียนรู้ภาษา กลุ่มที่มีความสามารถต่ำถูกรบกวนจากตัวลวงที่เป็นคำซึ่งมีความหมายสัมพันธ์กับคำศัพท์ที่กำหนดให้มากกว่ากลุ่มที่มีความสามารถสูง และพบว่าตัวลวงรูปภาพที่มีความสัมพันธ์กับคำศัพท์ที่กำหนดให้ช่วยส่งเสริมการเรียนรู้ภาษาในกลุ่มที่มีความสามารถต่ำได้น้อยกว่ากลุ่มที่มีความสามารถสูง ดังนั้นบุคคลสองภาษาที่มีความสามารถต่ำ ควรเรียนรู้คำศัพท์ใหม่ในภาษาที่สองด้วยการคิดเชื่อมโยงกับคำศัพท์ในภาษาที่หนึ่ง (เช่น เรียนรู้ภาษาอังกฤษโดยเชื่อมโยงกับภาษาเขมรที่เคยเรียนรู้มาก่อน) ในขณะที่บุคคลสองภาษาที่มีความสามารถสูงสามารถเรียนรู้คำศัพท์ใหม่ในภาษาที่สองได้โดยตรง (เช่น เรียนรู้คำศัพท์ภาษาอังกฤษจากรูปภาพที่มีความหมายสัมพันธ์กับคำศัพท์นั้น)

คำสำคัญ: Concept selection, Semantically related/unrelated context word distracter, Semantically unrelated/unrelated context picture distracter

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Effects of context words and pictures on bilinguals' concept selection: A study of language speech production task in the Khmer-English bilinguals

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Abstract

The purposes of this study were (1) to find out the effects of context word and picture distracters on bilinguals' language speech productions and (2) to compare the locus of concept selections of less-proficient and high-proficient bilinguals. There were 24 participants in both less-proficient and high-proficient groups categorized by the language production test of Gollan, Montoya and Werner (2002). The experiment was known as language speech production where individual subject was required to translate the presenting target word from English (L2) into Khmer (L1) under semantically related and unrelated context picture and word distracters. The reaction times (RTs) and accuracy were recorded using DMDX software. The data were analyzed by mean, standard deviation and three-way ANOVA.

The reaction times of language speech productions under context word distracters were faster than those of context picture distracters. Semantically related context words caused semantic interferences while semantically related context pictures increased semantic facilitations. Less-proficient bilinguals were more interfered by semantically related context word distracters than high-proficient bilinguals. Less-proficient bilinguals were less facilitated by semantically related context picture distracters than high-proficient bilinguals. In conclusion, the locus of concept selections of less-proficient bilinguals was at the lexical level where they needed to rely on lexical link from L1 in their language speech production. The locus of concept selections of high-proficient bilinguals, on the other hand, was at the conceptual level where they could directly conceptualize from semantically related context pictures.

Keywords: Concept selection, Semantically related/unrelated context word distracter, Semantically unrelated/unrelated context picture distracter

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Introduction

English is a global language and one of the most spoken languages throughout the world. As Cambodia is one of the ASEAN members and its integration will be officially implemented in the late 2015; therefore, ASEAN Article 34 approved that every nation has agreed to use English as an official language for international communication between countries in ASEAN region (ASEAN, 2008). In other words, English will mainly influence economic development, business, educations, tourism and international-relations in the ASEAN region. Consequently, after ASEAN integrations, the member with poor human resources in English competence will become inferior to the country that possesses better English, and it will be hard for them to keep up with challenges within the membership countries (ASEAN, 2008).

According to the model of bilingual language production adapted from Poulisse and Bongaerts (1994) described the process which bilinguals had to go through when naming the picture. This model explained that bilinguals need to involve in three sequential levels such as conceptual, lemma and phonological level in order to produce the right word in second language (L2). Firstly, it is the conceptual level which the semantic features related to the meaning of the pictured objects is activated in first language (L1) and second language (L2). The next level is called lemma which the abstract lexical representations for each of the lexical alternatives in both L1 and L2 occurred in the language production process. Finally, phonological level refers to the articulation of the right target word. For example, when the Spanish-English bilinguals were asked to name the picture of chair in English, they firstly try to semantically conceptualize the picture of *chair* in English and *silla* in Spanish, and then the abstract lexical representation occurred in both language at lemma level such as *table* in English and *mesa* in Spanish and so on. Finally, the phonological level occurs where bilinguals could produce the sound (chair) specifying the picture. The lemma level has been considered as the "hard problem" for bilinguals as they mostly come up with difficulty to select the correct word in response to the target concept, and also at this level both target and non-target lexical representations compete for activation. How could bilinguals deal with this challenge of the hard problem?

Bloem and La Heij (2003) introduced the Concept Selection Model (CSM) to provide solutions to the hard problem. This model faced the problem of lexical selections by showing that the hard problem would not cause the huge barriers for bilinguals because the problem was already solved at the conceptual level. The basic assumption of this model was that the target language selections occurred before lexical level basically at the conceptual level and especially taking place during the pre-verbalization where the target language to be responded to was already activated for bilinguals. For instance, when the Spanish-English bilinguals were asked to name the picture in English, the English word would be considered and strongly activated in the lexical process during the preverbal speech although some Spanish words could also be activated. However, this Concept Selection Model evidently allows high-proficient bilinguals to deal with the hard problem. What about the less-proficient bilinguals? Could less-proficient bilinguals be able to link L2 to concepts at conceptual level?

Based on Revised Hierarchical Model (RHM), Kroll and Stewart (1994) explained the lexical and conceptual representation in accordance to L2 proficiency. Bilinguals could access directly L1 word and its semantics while words in L2 relied on L1 language translation equivalent in order to access their meaning. This model demonstrated that word-to-concept connection was stronger for L1 while word-to-concept connection for L2 could be increased being positively correlated to L2 language proficiency level. In other words, if L2 English learners of Spanish were asked to name the picture of *dog* in English and Spanish, the word *dog*

had higher correlation to L1 while the word *perro* in Spanish would depend on translation equivalence or lexical link from L1 so that L2 word could be produced.

Green (1998) introduced the Inhibitory Control Model (ICM) where the process of bilinguals' language production was significantly depended on inhibition of the non-target language so that the target language had priority to be more activated. Generally, both L1 and L2 have the possibility to be activated. However, due to the language task schemas together with their inhibitory connection and suppression, the non-target language is inhibited. Then, the target language is regulated and activated; as a result, the language to be responded is ready for activation. However, as this language production occurs at the lemma level, ICM similarly inhibits the non-target words known as lemma in the same language. As a result, the target word can be activated and produced correctly. According to ICM, less-proficient bilinguals rely more on lexical inhibition of the non-target words.

Schwieter and Sunderman (2008) introduced the new model in bilinguals' language production entitled the Selected by Proficiency (SbP) Model. This model supported the ideas that less-proficient bilinguals depend on the lexical link from L1 known as language translation equivalent in order to produce L2 responses. Also, word-to-concept is stronger in L1 than in L2. However, for high-proficient bilinguals, this model showed very slight lexical link from L1 in language production and word-to-concept in L1 and L2 was almost equal. Thus, high proficient L2 could produce language responses without relying on L1 and they could directly conceptualize from the presenting stimuli and L2 word could be responded spontaneously.

To sum up, the process of bilingual language production is still controversial with various groups of linguists. Most of the studies did not differentiate between less-proficient and high-proficient bilinguals in their experiments. Also, there were very few studies conducted on backward language speech production tasks from L2 to L1 which is very significant and at the meantime could help linguists decide if at what levels bilinguals need lexical link from L1 in order to make language productions in L2 and to what extent they can independently conceptualize L2 at the conceptual level. Additionally, the effect of context distracters including words and pictures on bilinguals' language speech productions has not been defined by linguists. Hence, the effect of context distracters on bilinguals needs to be critically studied so that approaches to understand bilinguals could be more precisely especially in cross-linguistic contexts of Khmer-English bilingual.

Research Questions

1. How do semantically related and unrelated context picture and word distracters affect bilinguals' language speech productions? Which context would cause semantic interference and which context would lead to semantic facilitation?

2. What is the semantic relatedness effect (SRE) of context words and pictures on less-proficient and high-proficient bilinguals' language speech production? What is the locus of concept selection of less-proficient and high-proficient bilinguals during the language speech production?

Objectives of the Study

1. To investigate the effects of context words and pictures on bilinguals' language speech productions.

2. To compare semantic relatedness effect of context distracters and find out the locus of concept selections of less-proficient and high-proficient bilinguals' language speech productions.

Conceptual Framework

The main purpose of this research was to study the locus of concept selections of less-proficient and high-proficient bilinguals in Khmer-English learning context based significantly on the Selected by Proficiency (SbP) Model of Schwieter and Sunderman (2008). This model intended to explain the locus of concept selections of bilinguals in backward translation tasks. In this task, the presented stimulus was in L2 (English) while the context distracters were words (L1) and pictures which were either semantically related or unrelated to the stimulus. For example, if the stimulus L2 word was "*house*" the context word distracter with related semantic would be "*window*" presented in Khmer language while the unrelated semantic could be "*pencil*" also presented in Khmer language. Each subject in the experiment needed to give backward translation by translating the stimuli from L2 (English) to L1 (Khmer) as quickly as possible while ignoring the context distracters. This model supports the ideas that less-proficient bilinguals depend on lexical link from L1 known as translation equivalent while high-proficient bilinguals can independently conceptualize words or pictures directly into their L2. Therefore, the locus of concept selection of less-proficient bilinguals according to SbP is at the lexical level where less-proficient bilinguals needed to depend on lexical link from L1 known as first language translation equivalent. The concept selections of high-proficient bilinguals, however, happens at the conceptual level where they could directly and instantly conceptualize the stimuli. Additionally, context word distracters should cause more semantic interference in less-proficient bilinguals whereas context picture distracters should produce semantic facilitations for high-proficient bilinguals in a language speech production task.

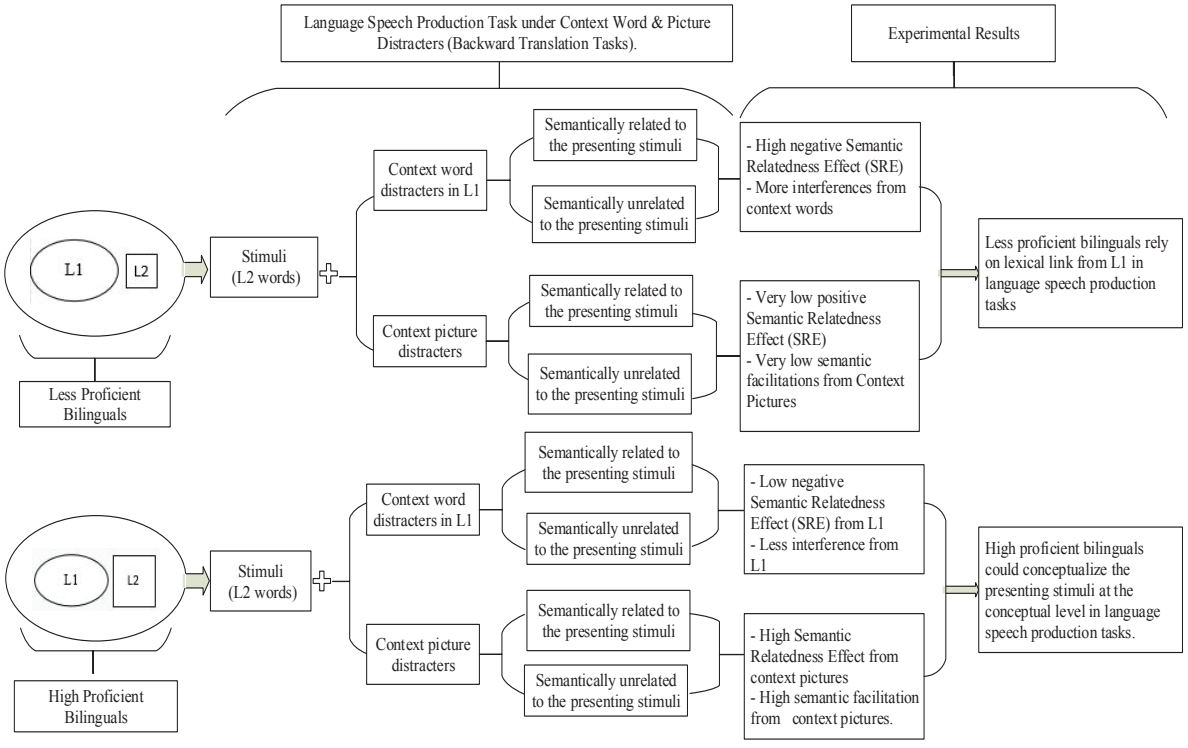


Fig. 1 Conceptual framework of the effects of context words and pictures on bilinguals' concept selections

Methodology

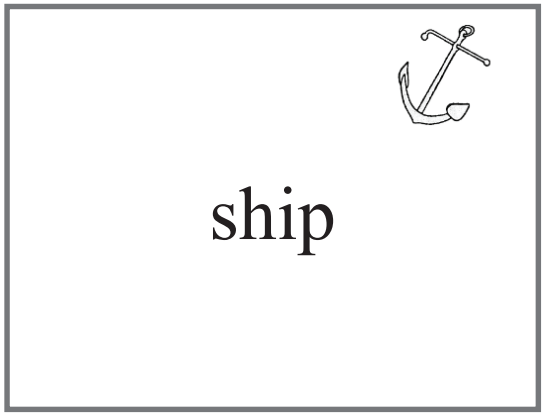
Participants

The whole number of population according to BELTEI International University Report in 2015 is 819 students who are pursuing their bachelor degree. Only 48 subjects who were normally healthy without visual deficit or severe past accident affecting the brain were used as the sample for this study. Those subjects were classified into two groups: 1) high-proficient bilinguals and 2) less-proficient bilinguals based on the result from language production test adapted from Gollan, Montoya and Werner (2002). There were 10 semantic categories (countries, clothing, animals, academic majors, colors, fruits, vegetables, things with wheels, musical instruments, and sports) for the whole test. For each category, every subject was given 60 seconds (1 minute) to generate as many lexical productions as possible in his/her second language (English). After 60 seconds, another semantic category was given, and so on until all the categories were assigned within 10 minutes for the whole test. If the language production test result of the subjects was lower than 100 points, those subjects were grouped into less-proficient bilinguals. If the language production result was 100 points or more, those subjects were classified into high-proficient bilinguals.

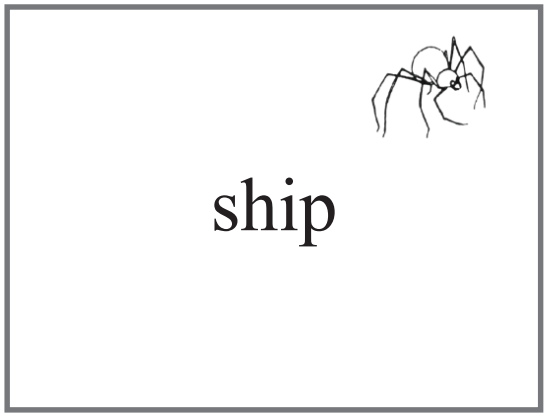
Stimulus/ Context Distracters

The stimuli being used in this experimental research were L2 words adapted from Bloem and La Heij (2003). The total number of stimuli consisted of 40 L2 words extracted from 9 categories such as vegetable (N=5), utensils (N=5), nature (N=4), building (N=4), vehicles (N=4), body parts (N=5), animals (N=5), furniture (N=4) and fruit (N=4). These stimuli were adapted from Schwieter and Sunderman (2008) together with Bloem and La Heij (2003) and also to adjust them to rightly fit into Khmer-English bilingual context for the research study.

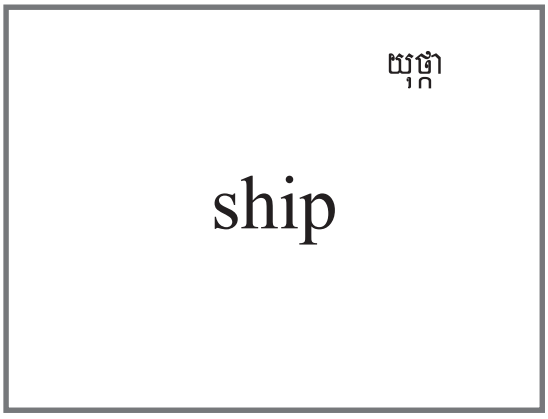
In addition to the stimuli, there were two types of context distracters comprising of context words and context pictures. Context word distracters were divided into two categories: 1) semantically related context word distracters with semantic relatedness to the presented stimuli and 2) semantically unrelated context word distracters without semantic relatedness to the presented stimuli. For context picture distracters, they were similarly classified into two groups: 1) semantically related context picture distracters and 2) semantically unrelated context picture distracters.



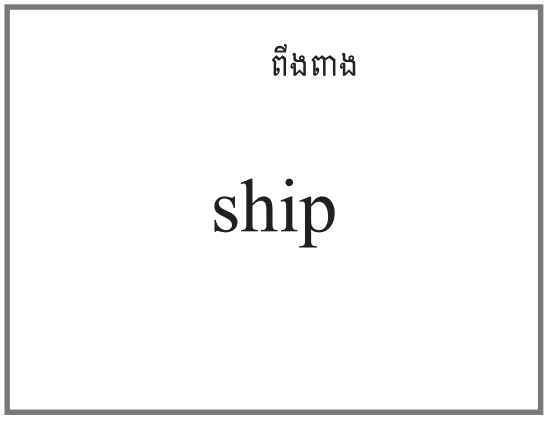
Semantically related context picture distracter



Semantically unrelated context picture distracter



Semantically related context word distracter



Semantically unrelated context word distracter

Fig. 2 The position of stimuli and context distracters

Procedure

1. Language history questionnaire

All the subjects were asked to complete a survey in order to find out their language history, education, and language experiences. This survey was very significant for the researcher to later analyze and conclude this study result relevant to less-proficient and high-proficient bilinguals' language proficiency. This survey was adapted from Schwieter and Sunderman (2008).

2. Familiarization

Before running the experiment, a familiarization test was conducted for each subject. In this familiarization, all the subjects were asked to translate each stimulus into their L1 but to ignore words that they were uncertain about.

3. Practice phase

Prior to running the experiment, each subject was asked to start with 2 practice tests comprising 10 trials each. These tests represented the real tests consisting of Test I: Language speech production task with context word distracters and Test II: Language speech production task with context picture distracters. Each practice test would take at least 1.5 minutes where every individual subject received verbal instruction and explanation from the researcher. The objective was to ensure that all the subjects understood the procedures and goals of the experiment.

4. Test phase

Each trial consists of a stimulus and a distractor presented with 0 ms of Stimulus Onset Asynchrony (SOA) i.e. both stimulus and distracter appeared simultaneously. Individual subject was asked to produce response in L1 by translating the stimuli from English (L2) into Khmer (L1) while at the meantime they were being distracted by context word distracters in L1 (Khmer) and context picture distracters. For test I, the distracters were context words in L1 (Khmer) with semantic relatedness and unrelatedness to the stimuli. The same stimulus was used twice in test I. For test II, the distracters were semantically related and unrelated context picture. Likewise, each stimulus was used twice for test II. The order of the presented items was randomized during the experiment.

The software program DMDX (version 5.1.2.1) of Forster & Forster (2003) firstly started with a fixation point known as a plus sign (+) in the middle of the computer screen against the white background. The fixation point, stimuli and context word distracters were all designed in black color and were typed in small cases. Similarly, context picture distracters were black and white line drawings adapted from Snodgrass and Vanderwart (1980). The fixation point (+) remained for 500 milliseconds in the middle of the screen before it disappeared and then the stimuli and context distracters instantly followed simultaneously. The context distracters appeared to the right above the stimuli (Schwieter and Sunderman, 2008). The subjects had to translate each stimulus into their L1 as quickly as possible while ignoring the context distracters. The subjects were expected to respond within the time limit of 3000 millisecond, and then the stimulus and context distracter disappeared by blank computer screen that lasted for 5001 millisecond. This running of DMDX continued until all the trials (N=80) for both blocks in each test were successfully completed. For test II, the process was the same, but the context word distracters were replaced by context picture distracters. Test I & II cost each about 10 minutes equally from each subject during the experiment.

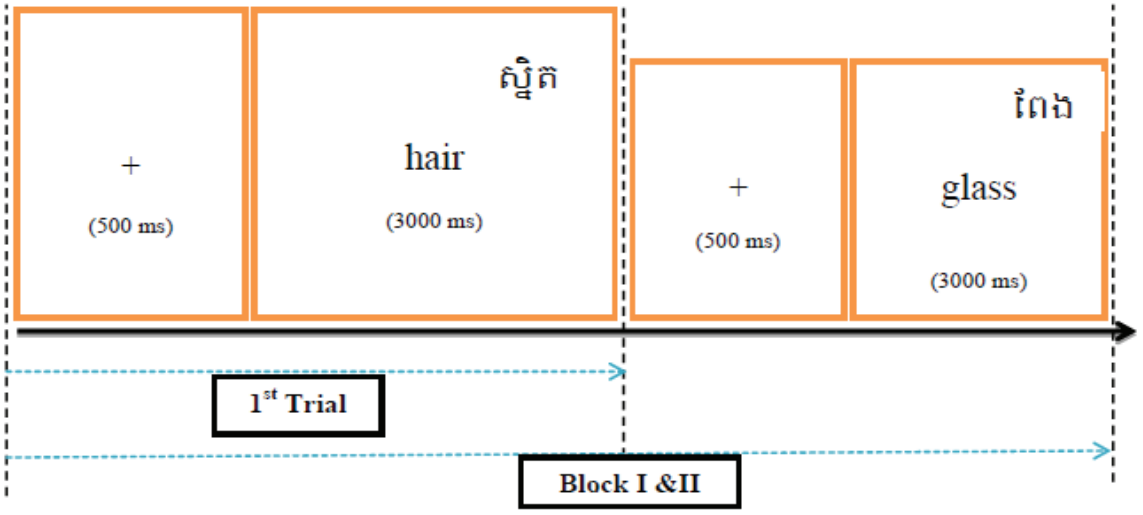


Fig. 3 Examples of language speech production task with context word distracters

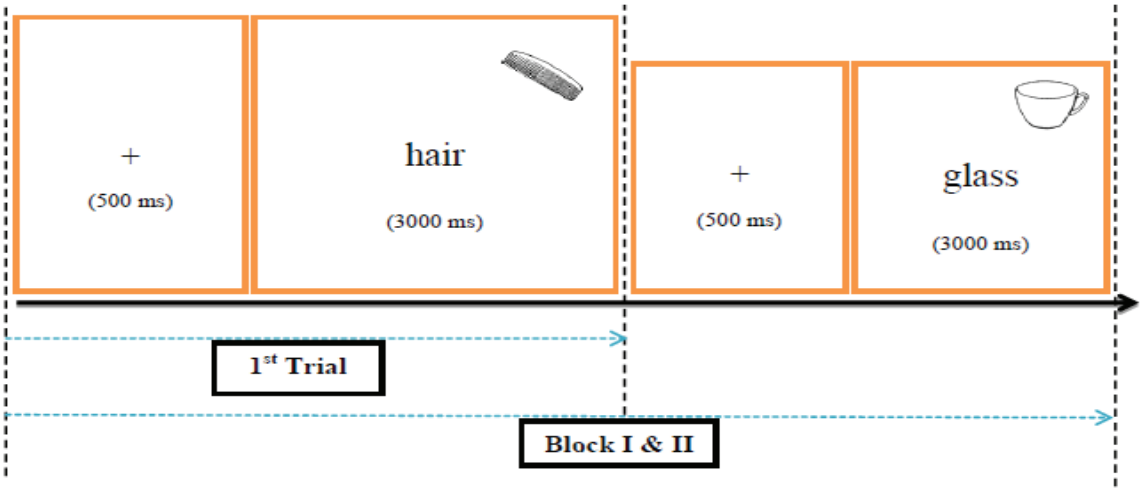


Fig. 4 Examples of language speech production task with context picture distracters

Results

1. Mean of reaction time (Milliseconds) from the effects of context (Word & picture), relatedness (Semantically related & unrelated) and proficiency (Less & high) on bilinguals' language speech production

Considering first the types of context distracters, the reaction time of bilinguals were faster with context word distracters (Mean = 1029.40, *SD* = 118.64) than context picture distracters (Mean = 1091.47, *SD* = 142.68). As for proficiency, the less proficient group had longer reaction times than high proficient group with both pictures and words distracters. The less proficient group of bilinguals similarly had longer reaction times than high-proficient bilinguals in both semantically related and unrelated context distracters. Regarding semantic relatedness of context word and picture distracters, semantically related context picture

distracters (Mean = 1068.45, *SD* = 144.38) led to faster reaction time than semantically unrelated context picture distracters (Mean = 1114.49, *SD* = 138.64). However, semantically related context word distracters (Mean = 1051.49, *SD* = 138.64) caused slower reaction time than semantically unrelated context word distracters (Mean = 1007.31, *SD* = 111.87). Last, high proficient group of bilingual could perform faster in both semantically related and unrelated context picture and word distracters when comparing to less-proficient group of bilinguals. (See more details in table 1.)

Table 1. The mean of reaction times (Milliseconds) from the effects of context, relatedness and proficiency on bilinguals' language speech production

	Mean	*SD*
1. Less proficient group	1090.02	125.53
2. High proficient group	1030.83	127.48
3. Context picture distracters	1091.47	142.68
4. Context word distracters	1029.40	118.64
5. Semantically related	1059.97	122.42
6. Semantically unrelated	1060.90	111.83
7. Context picture distracters from less proficient group	1126.93	135.26
8. Context picture distracters from high proficient group	1056.00	132.52
9. Context word distracters from less proficient group	1053.19	105.23
10. Context word distracters from high proficient group	1005.68	119.51
11. Semantically related context distracters from less proficient group	1101.16	123.08
12. Semantically related context distracter from high proficient group	1018.78	109.26
13. Semantically unrelated context distracters from less proficient group	1078.89	112.20
14. Semantically unrelated context distracters from high proficient group	1042.90	110.87
15. Semantically related context picture distracters	1068.45	144.38
16. Semantically unrelated context picture distracters	1114.49	138.64
17. Semantically related context word distracters	1051.49	122.22
18. Semantically unrelated context word distracters	1007.31	111.87
19. Semantically related context picture distracters from less proficient group	1122.74	135.91
20. Semantically related context picture distracters from high proficient group	1014.16	134.07
21. Semantically unrelated context picture distracters from less proficient group	1131.13	139.24
22. Semantically unrelated context picture distracters from high proficient group	1097.84	138.97
23. Semantically related context word distracters from less proficient group	1079.58	117.91
24. Semantically related context word distracters from high proficient group	1023.39	122.38
25. Semantically unrelated context word distracters from less proficient group	1026.66	96.86
26. Semantically unrelated context word distracters from high proficient group	987.96	124.14

2. The effects of context, relatedness and proficiency on bilinguals' language speech production

A three way ($2 \times 2 \times 2$) repeated measurement ANOVA was performed on the mean of reaction times (RTs) with context (Word & picture) and relatedness (Related & unrelated) as within-subject factor and group (Less-proficient and high-proficient bilinguals) as between-subject factor. The main results of $2 \times 2 \times 2$ repeated measurement ANOVA are reported in Table 2. The main findings were the following:

There was no significant different effect of proficiency on reaction times (RTs) between less-proficient and high-proficient subjects during the language speech production test F (1, 46) = 3.35, p = .07. The reaction times of less-proficient and high-proficient bilinguals were not significantly different.

The main effect of context (Word & picture) was significant due to the faster reaction times under context word distracters (Mean = 1029.40, *SD* = 118.64) than that under context picture distracters (Mean = 1091.47, *SD* = 142.68), $F(1, 46) = 16.78$, $p < .01$, $\eta^2 = .26$. Bilinguals produced faster reaction times under context word distracters than context picture distracters.

Semantic relatedness (Related & unrelated) did not have significant effect on bilinguals' language speech production $F(1, 46) = .02$, $p = .88$, $\eta^2 = .001$. The reaction times under semantically related/unrelated pictures and words were not significantly different.

There was the significant interaction effect among context, relatedness and proficiency. The mean of reaction times under semantically related context picture distracters of high-proficient bilinguals (Mean = 1014.16, *SD*= 134.07) was faster than that of less-proficient bilinguals (Mean =1122.74, *SD*= 135.91). It meant semantically related context pictures facilitated language speech production and concept selections to high-proficient bilinguals more than less-proficient bilinguals. This result supported Selected by Proficiency (SbP) Model of Schwieter and Sunderman (2008) together with Concept Selection Model (CSM) of Bloem and La Heij (2003) who claimed that semantically related context picture distracters increased semantic facilitation to high-proficient learners. In other words, high-proficient bilinguals could conceptualize the semantic representations from the semantically related context pictures. However, the reaction time under semantically related context word distracters from less-proficient bilingual (Mean = 1079.58, *SD* = 117.91) was slower than that of high-proficient bilinguals (Mean = 1023.39, *SD* = 122.38). In other words, semantically related context word distracters caused more semantic interference among less-proficient bilinguals. Regarding semantically unrelated context word and picture distracters, less-proficient bilinguals in overall spent longer reaction time than high-proficient bilinguals.

There was no statistical significant interaction effect between context and proficiency $F(1, 46) = .60$, $p < .44$, $\eta^2 = .01$. The reaction times of less-proficient and high-proficient bilinguals performing the language speech production tasks under context word and picture distracters were not significantly different.

However, there was statistical significant interaction effects between relatedness and proficiency level $F(1, 46) = 14.80$, $p < .01$, $\eta^2 = .24$. Less-proficient bilinguals (Mean= 1101.16, *SD* = 123.08) had longer reaction time than high-proficient bilinguals (Mean = 1018.78, *SD* = 109.26) when semantically related context distracters were being presented. Similarly, less-proficient bilinguals (Mean = 1078.89, *SD* = 112.20) had longer reaction time than high-proficient bilinguals (Mean = 1042.90, *SD* = 110.87) when semantically unrelated context distracters were presented.

There was also statistical significant interaction effects between context and relatedness $F(1, 46) = 68.87$, $p < .01$, $\eta^2 = .60$. The mean of reaction time under semantically related context picture distracters (Mean = 1068.45, *SD* = 144.38) was faster than the mean of reaction time under semantically unrelated context picture distracters (Mean = 1114.49, *SD* = 138.64). In contrast, the mean of reaction time under semantically related context word distracters (Mean = 1051.49, *SD* = 122.22) caused slower reaction time than the mean of reaction time under semantically unrelated context word distracters (Mean = 1007.31, *SD* = 111.87). Context pictures with semantic relatedness led to semantic facilitation which assisted bilinguals' language speech production while context words with semantic relatedness caused semantic interference which slowed down bilinguals' language speech production.

Table 2. Result of $2 \times 2 \times 2$ repeated measurement ANOVA about the effects of context, relatedness and proficiency on reaction times (RTs) of bilinguals' language speech production ($n = 48$)

	SS	*df*	*MS*	*F*	*p*	η^2
Between subjects						
Proficiency	168149.74	1	168149.74	3.35	.07	.07
Error	2310207.04	46	50221.89			
Within-subject						
Context	184921.08	1	184921.08	16.78**	.00	.26
Relatedness	41.56	1	41.56	.02	.88	.001
Context x proficiency	6622.58	1	6622.58	.60	.44	.01
Relatedness x proficiency	25824.50	1	25824.50	14.80**	.00	.24
Context x relatedness	97662.85	1	97662.85	68.87**	.00	.60
Context x relatedness x proficiency	10017.94	1	10017.94	7.06*	.01	.13
Error	65234.88	46	1418.15			

Note: * $p < .05$, ** $p < .01$

3. Semantic relatedness effects (SRE) on bilinguals' concept selections

Table 3. Mean of Reaction Time (RTs), Percentage of Accuracy (%Acc), and Semantic Relatedness Effects (SRE)

	Less-proficient group				High-proficient group			
	word		picture		word		picture	
	RT	%Acc	RT	%Acc	RT	%Acc	RT	%Acc
Unrelated	1026.66	87.08	1131.13	91.80	987.96	94.69	1097.84	96.77
Related	1079.58	88.23	1122.74	93.02	1023.39	95.00	1014.16	94.17
SRE[1]	-52.92		+8.39		-35.43		+83.68	

Note: [1] The semantic relatedness effect is calculated as the difference between unrelated and related conditions. Positive values refer to facilitation while negative values refer to interference.

Regarding semantic interference, the less-proficient bilinguals suffered more lexical interference (-52.92 ms) comparing to high-proficient bilinguals (-35.43 ms) when context word distracters were being presented during the experiment. This meant that less-proficient bilinguals needed to rely more on lexical link from L1 in language speech production while high-proficient bilinguals relied less on L1 link. Regarding semantic facilitation, more-proficient bilinguals experienced more semantic facilitation from context picture distracters (+83.68 ms) than less-proficient bilinguals (+8.39 ms).

Discussion

Could context (Picture & word) differently affect bilinguals' language speech production? The answer is definitely "yes". The Reaction Times (RTs) of language speech production with context word distracters were faster than with context picture distracters. This meant that while context picture was being presented, the majority of Khmer-English bilinguals spent longer time to translate the stimuli. These context picture distracters took more participants' attentions and time when comparing to context word distracters. This finding supported the experiment conducted by Schwieter and Sunderman (2008) who studied English-Spanish bilingual context and Bloem and La Heij (2003) who studied Dutch-English bilingual context. Their results similarly supported that context word distracters would interfere less than context picture distracters.

When relatedness combined with proficiency level of less-proficient and high-proficient group of bilinguals, significant interaction effects occurred to the reaction time of bilinguals' language speech production. High-proficient bilinguals spent less time in language speech production when semantically related picture was being presented. According to the Concept Selection Model (CSM) of Bloem and La Heij (2003) and Selected by Proficiency Model of Schwieter and Sunderman (2008), semantically related pictures activated their conceptual representations but not their names and high-proficient bilinguals could conceptually mediate the semantically related context picture distracter but not its name. In other words, high-proficient learners relied on concept mediations from semantically related context picture distracters. This concept mediation could occur at the conceptual level.

There was a significant interaction effect between context and relatedness on bilinguals' language speech production. Semantically related context word distracters significantly caused slower reaction time than semantically unrelated context word distracters. To put this result into critical analysis, semantically related context word distracters caused semantic interferences which distracted and slowed down bilinguals' language speech productions. However, semantically related context picture distracters led to faster reaction times than semantically unrelated ones. It meant that semantically related context picture distracters facilitated bilinguals' language speech productions which made the reaction time faster. The results from Selected by Proficiency (SbP) Model of Schwieter and Sunderman (2008) together with Bloem and La Heij (2003) also claimed parallel explanations that semantic interferences were caused by semantically related context word distracters while semantically related context picture distracters led to semantic facilitations during bilinguals' language speech productions.

Regarding semantic relatedness effect, it revealed that less-proficient Khmer-English bilinguals relied more on lexical link from L1 in their language speech productions. It meant that less-proficient bilinguals needed to think and relate the presenting stimuli into their L1 first when they were asked to translate the presenting stimuli from L2 (English) into L1 (Khmer). That was the reasons that more sematic interferences occurred to less-proficient bilinguals (-52.92 ms). To

conclude, the locus of concept selections of less-proficient bilinguals' occurred at the lexical level as they required lexical link from L1 to response in their language speech productions. In other words, less-proficient learners used lexical mediations to produce language translation from L2 (English) to L1 (Khmer). It is logical that less-proficient bilinguals get more influence and interference from their L1. That is why when less-proficient bilinguals speak or write in L2, they show more tendencies to their L1, especially in term of grammatical structures, concepts and styles. This tendency and influence from L1 would be decreased respectively when they become more proficient. According to the Revised Hierarchical Model (RHM) of Kroll and Stewart (1994), lexical link from L1 is very strong for less-proficient bilinguals. For example, if less-proficient bilinguals see the picture, first of all they will translate it into their L1 first and then they rely on translation equivalent from L1 to L2 so that L2 word could be responded to the picture correctly.

High-proficient bilinguals, on the other hand, relied less on lexical link from L1 as there were less semantic relatedness effect from context word distracters (-35.43 ms). Additionally, more semantic facilitation occurred to high-proficient bilinguals (+83.68 ms) than less-proficient bilinguals (+8.39 ms) when context picture distracter were being presented during the experiment. This meant that high-proficient bilinguals used concept mediations from context picture distracters to response to the presenting stimuli. To sum up, the locus of concept selections of high-proficient bilinguals occurred at the conceptual level as high-proficient bilinguals could conceptualized the semantically related context picture distracters but not their names. However, the ability to conceptualize from semantically related context picture distracters was not exclusively as they still somehow rely on lexical link from L1. The results of the locus of concept selection of Khmer-English bilinguals were paralleled with Concept Selection Model of La Heij (2003) together with Selected by Proficiency (SbP) Model of Schwieter and Sunderman (2008).

To sum up regarding the "hard problem" being discussed in the introduction, less-proficient bilinguals solved the hard problem by relying on strong lexical link from L1 known as translation equivalent. Therefore, when less-proficient bilinguals speak or response in L2, firstly they have to rely on their L1 translation equivalent so that the target L2 word could be spoken out or responded. High-proficient bilinguals, on the other hand, relied less on lexical link or translation equivalent from L1 as they could conceptualize the word directly into their L2. As a result, they could speak out or response in L2 word directly with less interference from L1.

Recommendations

The benefits of the current study

1. As semantically related context pictures assist English language acquisition, the learning material designs should have as many related context pictures as possible, so that Khmer-English learners could highly benefit from them.

2. Semantically related context pictures could be presented to Khmer-English learners as a technique to present new vocabulary, so that learner could improve their context comprehension and vocabulary development.

3. As semantically related context words cause semantic interferences, and high-proficient learners rely less on lexical link from Khmer (L1), it is recommended that word translations from Khmer is not effective while direct translations or explanations in English (L2) are more crucial in enhancing English language acquisition among Khmer-English learners.

Recommendation for further studies

The following recommendations are offered for further studies:

1. The effects of context, relatedness, and proficiency level on the locus of bilinguals' concept selections should be studied in other bilingual contexts besides Khmer-English, so that a comparison of sematic relatedness effects and locus of concept selections of bilinguals could be drawn out for example in Thai-English bilingual.

2. As this present study focused on the black and white context picture distracters, the next study should be conducted on the comparison between colored and non-colored context picture distracters in order to find out if colors could bring significantly different results in bilinguals' language speech production.

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