Learning a new language through subtitles

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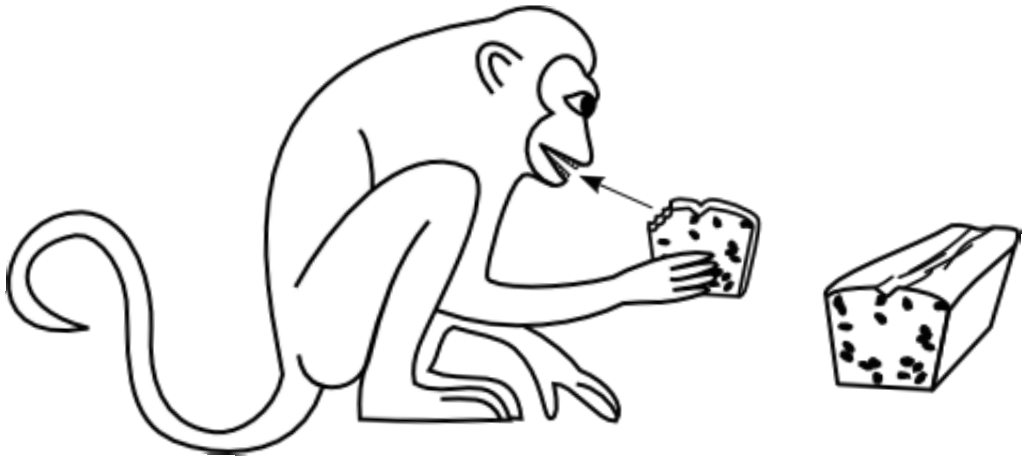

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Abstract

The effects of subtitling language in second language acquisition from television were examined, in the context of a learning task with subtitled spoken words in Indonesian supported by pictures. Indonesian, or L2, subtitling yielded better recall of learned items in an intentional language learning setting than Dutch, or L1, subtitling, as well as better results on a picture-sound matching task. These findings suggest that language learners benefit more from same-language subtitling than from standard subtitling when learning a language from television.

Learning a new language through subtitles

Learning a new language is often difficult, especially when that language differs much from your own. The difficulty may be, for example, caused by interference from your native language or just because you have a lack of patience or time. There are many different techniques for learning a new language (Krashen, 1982), some of which are quite effective. Schools may use the immersion method (Freed, 1998), which stimulates students to communicate in a foreign language with their peers and teachers, or they may apply a more traditional method, in which students learn to translate words from one language into another.

It seems that the medium of television can also play a role in the acquisition and strengthening of (knowledge of) a foreign language. A now famous example among parents of young children is Muzzy[1], a television programme that was made for children to learn a foreign language by merely watching cartoon characters and listening to their conversations in this foreign language. Interestingly, most participants in the current study reported to have acquired much of their basic knowledge of the English language at a very young age by watching English cartoons and other programs on television, accompanied by subtitles in their native language (L1). This last observation was not new to us, because we personally had the same experience, and research by Koolstra and Beentjes (1999) has confirmed that subtitles really induce a learning effect. In the current study, we will investigate whether the language in which subtitles are offered makes a difference in how well a language can be learned from watching subtitled television. If watching television in a foreign language can help to acquire this language in such an easy and fun way, then why not implement it as a formal language learning method? Before zooming in on our study into second language learning and subtitles, we will first review the available subtitle studies.

In some countries, most television programs and movies are dubbed, making it impossible to learn the original language because nothing of that language remains (Koolstra,

Peeters, & Spinhof, 2002). This method does, however, make it easier to understand what the movie or program is all about (Koolstra et al., 2002). People from countries where most foreign language films are dubbed have some trouble communicating in English, suggesting that they might be missing this element of incidental learning. Of course, this lack of knowledge about the English language could also have historical reasons. France and Germany, for instance, may have tried to protect their own language from foreign influences in the past, resulting in dubbing becoming the translation method of choice for films and television.

d'Ydewalle and de Bruycker (2007) showed that, when subtitles are presented, they are always paid some attention to. In their study, standard subtitles (with the soundtrack in a foreign language and subtitling in the native language) were fixated more frequently than reversed subtitles (soundtrack in the native language and subtitling in a foreign language). However, Lambert, Boehler, and Sidoto (1981) found that, for learning purposes, reversed subtitling showed to be more promising than did standard subtitling. To show foreign language students how much more interesting subtitled film can be compared to dubbed film, Zanón (2006) proposed a learning method in which students use special programmes to add subtitles to film, thereby learning to translate or produce words and sentences in a foreign language. This method was already offered as a training programme at Saint David's University College Lampeter since 1990 (Williams & Thorne, 2000) and has been advocated by Williams and Thorne (2000). Although this method helps to improve linguistic skills in both L1 and L2, it can only be used by students who are already very familiar with this second language.

In the current study, same-language subtitling, i.e., where the subtitling language is the same as the language on the audio channel (in this case, both in a foreign language, L2), was compared to standard subtitling, i.e., where subtitling is in the viewers' native language and

audio in a foreign language, as a method for language learning. Other research in this area was conducted to test this method for strengthening or maintaining second language skills (Holobow, Lambert, & Sayegh, 1984; Lambert et al., 1981; Lambert, 1986; Mitterer & McQueen, 2009). These studies were conducted using groups of participants who already had prior education in the foreign languages that were used in the experiments. Young Canadian French immersion students participated in the study by Holobow et al. (1984), where the experiment focused on learning French using different language combinations of spoken and written words in L1 and L2. In the study by Mitterer and McQueen (2009), Dutch university students learned to adjust to strong Scottish and Australian accents by watching short movie clips in either Scottish or Australian, which were either subtitled in Dutch or English or not subtitled at all[2]. In both studies, participants were tested on their understanding of words and sentences in L2 after a learning phase, and both concluded that same-language subtitling shows more promise for foreign language learning than standard subtitling does. However, we see no convincing reason why subtitling would only be effective for learning in students who already have considerable knowledge of the language in question.

The current study focused on learning a language for the first time, implying that participants have no prior knowledge of the language they are going to learn in the experiment. Even though using an artificial language may be a good research option for some experimental conditions, we specifically set out to investigate whether an effect of subtitling language is found when a *real* language is learned. Because the idea is to teach vocabulary, not grammar, we used Indonesian to teach to Dutch students: The ordering of words is the same for these languages in simple sentences, but the Indonesian and Dutch vocabularies are not much alike. Because Indonesia was once a Dutch colony, some cognates are present in Indonesian, but it has many words of its own that are not understood by the Dutch without any prior knowledge.

Although it is believed that children learn a foreign language faster and more easily than do adults (Lenneberg, 1967), and most language learning research focuses on young children (e.g. Dulay & Burt, 2006; Elley, 1989; Elley & Mangubhai, 1983; Holobow et al, 1984; Koolstra & Beentjes, 1999), adults are more and more interested in learning a new language, and learning methods are being developed all the time. The current study is mainly focused on testing a learning method that works well for adults, but does not rule out the use of this method by children.

Based on previously discussed research by Holobow et al. and Mitterer and McQueen, a hypothesis was formed about what would be the best choice for subtitling language. We expect that spoken words in L2 combined with subtitling in L2 will help to learn a language better and faster than a combination of spoken words in L2 and subtitling in L1. One basic theoretical argument here is that the visual-orthographic code of the subtitle may support and strengthen auditory-phonological code of the sound track when both consist of word forms from the same language (cf. Posner, 1981).

To create an efficient language learning method using subtitles, some earlier research should be taken into account. First is the research done by Kersten and Earles (2001), who showed that adults learn a language better when it is offered to them in bite-sized pieces at first, and slowly becomes more complex. This might also explain why children seem to be better at learning languages than adults: They are not able to process large segments of language, encouraging them to learn the meanings of individual segments. The second finding that should be taken into account is that of Shams and Seitz (2008). They argue that multisensory learning is more effective than unisensory learning, because our cognitive and perceptual mechanisms are completely adapted to multisensory input, and thus optimized for multisensory environments.

The learning method we have tested here is based on these findings. The information that is offered during the learning phase consists of short spoken sentences containing three words (an agent, an action and a patient), a picture depicting what is being said, and of course, subtitles displaying either exactly what has been said in the spoken sentence (L2 subtitling) or an exact translation of the spoken sentence in just as many words (L1 subtitling, not counting words like 'the').

Method

Participants

Twenty-four students of the Radboud University Nijmegen participated in the experiment (19 female, five male, M_{age} = 22.8 years, age range = 18–37 years) after signing up through the online university's experiment management system. All participants were native Dutch speakers and started learning English as a second language from the mean age of 9, as is common in the Netherlands. Most participants reported to have learned German and French in high school, as is also common in the Netherlands, but these languages were often no longer used later in life. None of them reported to have any prior knowledge of the Indonesian language.

The participants were randomly divided into two groups: one group that would be learning with Dutch subtitles and the other group learning with Indonesian subtitles. They were told in advance that they would be learning Indonesian and received €10 in gift certificates or were awarded one participant point for their participation in the experiment[3].

All participants filled out a language proficiency questionnaire after completing the entire experiment, to assess their self-reported proficiency in English and other languages they might be familiar with.

Materials and Procedure

The stimulus materials were created from a large set of pictures, from which unclear or ambiguous items were removed (courtesy of R. J. Hartsuiker, Ghent University). The Dutch and Indonesian description words for these pictures were added, after which all split words were taken from the set (e.g., 'buah apel', which is Indonesian for apple, or 'agen polisi', which is Indonesian for policeman) as well as all repeats (e.g., the Indonesian word 'kura-kura', meaning land turtle; using these repeats is quite common in the Indonesian language). Finally, all cognates were removed, leaving a set of 108 items.

From this set, 20 agents and 20 patients were chosen to form sentences. Based on these final sets, eight verbs were chosen to form simple sentences with one agent, one verb, and one patient. The agent and patient sets were both split into two equal groups to assess the effects of frequency of presentation, one group for high frequency (8 occurrences per learning phase) and one group for low frequency (4 occurrences per learning phase) , with equal mean word length for the Indonesian words. Frequency in this case refers to the number of times a particular word (agent or patient) was administered in the learning phase of the experiment, which is not based on the natural occurrence of words in everyday life. Words were divided into frequency groups in such a way that agents that could not be used in combination with many of the verbs we used were placed in the low frequency group. Human agents were placed in the high frequency group and unlikely sentences were avoid (e.g., 'The cow throws the chair', something a cow cannot actually do).

To form the sentences, lists were made of the agents and patients, with high frequency words appearing eight times and low frequency words appearing four times, and one list with the eight verbs all appearing thirty times. From these lists, words were hand-picked to form a total of 240 sentences.

All single words and sentences were recorded in Praat (Boersma and Weenink, 1992-2010) by a native Indonesian speaker who had also helped to find the correct translations in the first stages of selecting stimuli.

All pictures were re-drawn using vector-drawing in Inkscape[4] and combined to depict the sentences as vividly as possible. Vector-drawing was necessary to position the agents differently for each action without making them look unnatural.

Procedure

A timeline of the experiment procedure can be found in Figure 1. Here follows a detailed description of the different elements.

The experiment began with a short picture-sound matching task to test the participant's initial knowledge of the Indonesian words they were going to learn. In each trial of this task, participants viewed a picture on a computer screen and listened to a spoken word over a set of head phones. Next, they had to indicate whether or not the picture depicted what was being said by pressing either the "1" (yes) or the "0" (no) key on a standard QWERTY keyboard. All agent and patient items from the original stimulus set were used in this task, half of which were incorrect combinations of the picture and spoken word. The incorrect combinations were made with words that had different or the same roles (e.g., a picture of a patient combined with a description of an agent, or a picture of a patient combined with a description of another patient), and words that had different or the same frequencies. The order of these 40 trials was randomized for each participant.

After this pretest, a learning phase was initiated with the 240 short spoken sentences in Indonesian. These sentences were also randomized for each participant, accompanied by a picture depicting what was being said, and had subtitling in either Indonesian or Dutch, depending on the experimental group the participant belonged to. Each trial in the form of a combination of orthographic (subtitling), phonological (spoken sentence), and semantic

(picture) information was presented for 5000 ms, with a 500 ms 'break' between trials. The stimulus onset asynchrony between the spoken sentence and the picture was set to 400 ms. Subtitling was presented right at the beginning of each trial. A short break was offered after 120 trials.

Following the learning phase, a recall task was used to test the participant's knowledge of the words they had just learned. For each trial in this task, the participant would hear a spoken word in Indonesian and was asked to type in what they believed this word meant in Dutch. All agents, patients and verbs used in this experiment were offered in this task, resulting in 48 trials, which were shown in a new random order to each participant.

The recall task was then followed by another take of the picture-sound matching task, in the same way as described above. This time, the incorrect combinations of picture and spoken word were different, to avoid the effect of participants learning the incorrect combinations rather than translations of the Indonesian words.

After this testing phase, a new learning phase was offered with the exact same 240 sentences as before, offered in a new random order. This learning phase was again followed by the same recall task and picture-sound matching task, with new incorrect combinations in the latter, and trials were presented in a new random order in both tests.

Even though the participants were asked to finish the tests as quick as possible, some of them took their time with the recall task, because they were really determined to remember every single word correctly. While the whole experiment could be finished in approximately 60 minutes (with 44 minutes fixed for the learning phase), most participants took a little longer, with a maximum time of 90 minutes.

Results

Analyses focused on the number of correct answers in both recall and picture-sound matching task, with two measurements for recall (between learning phases, and post-test) and

three measurements for the picture-sound matching task (pre-test, between learning phases, and post-test) for each participant. In addition, the frequency of presentation effect and the effect of word role were derived from scores in the recall task (see Table 1). Only significant effects ($p < .05$) and trends ($.05 < p < .20$) that were deemed relevant for the current research will be discussed here.

Recall task

Scores on the recall task were examined using a 2 × 2 (Test Moment [between learning, post-test] × Subtitles [Dutch, Indonesian]) repeated measures multivariate analysis of variance (ANOVA). The analysis only revealed a significant main effect of test moment, $F(1, 22) = 163.54$, $p < .001$, $\eta_p^2 = .88$, with the number of correct answers increasing over time. The effect of subtitling language did not prove to be significant in the current study, although there was a small trend for Indonesian subtitles to give better test results than Dutch subtitles ($p < .17$), as can be seen in Figure 2.

Frequency of presentation effect and Role effect. The effects of word frequency and word role were assessed by running a 2 × 2 × 2 × 2 × 2 (Role [agent, patient] × Frequency [high, low] × Subtitles [Dutch, Indonesian] × Test Moment [between learning, post-test] × Gender [female, male]) repeated measures multivariate ANOVA. This ANOVA revealed that both of frequency, $F(1,20) = 8.64$, $p = .008$, $\eta_p^2 = .302$, which can also be seen in Figure 5, and test moment, $F(1, 20) = 109.58$, $p < .001$, $\eta_p^2 = .85$ main effects were significant. There was also a significant Role × Frequency interaction, $F(1, 20) = 13.29$, $p = .002$, $\eta_p^2 = .399$, which appeared to reflect the fact that agents with a low frequency of presentation were recalled better than high frequency agents, while patients with a high frequency of presentation were recalled better than low frequency patients. Interestingly, a significant effect of subtitle language, $F(1, 20) = 5.16$, $p < .05$, $\eta_p^2 = .21$, was found here.

Separate analyses of between-learning and post-test using two 2 × 2 × 2 (Role [agent, patient] × Frequency [high, low] × Subtitles [Dutch, Indonesian]) repeated measures ANOVAs revealed significant main effects of frequency, $F(1, 22) = 9.76$, $p = .005$, $\eta_p^2 = .307$, and role, $F(1, 22) = 11.72$, $p = .002$, $\eta_p^2 = .348$, and a significant Role × Frequency interaction, $F(1, 22) = 30.38$, $p = .001$, $\eta_p^2 = .398$, for the between learning test, but only a significant main effect of role, $F(1, 22) = 4.93$, $p = .037$, $\eta_p^2 = .183$, and a significant Role × Frequency interaction, $F(1, 22) = 5.39$, $p = .030$, $\eta_p^2 = .197$, for the post-test. In both the between-learning test and the post-test, the Role × Frequency interaction was the same as the overall Role × Frequency interaction described earlier.

Picture-sound matching task

The scores for the picture-sound matching task pre-test ($M = 19.00$, SD = 2.62) did not differ significantly from the expected score of 20, given the 50 percent guessing chance on 40 items.

Scores on the picture-sound matching task were examined using a 2 × 2 (Test Moment [pre-test, between learning, post-test] × Subtitles [Dutch, Indonesian]) repeated measures multivariate ANOVA. The ANOVA revealed a significant main effect of test moment, $F(2, 21) = 284.47$, $p < .001$, $\eta_p^2 = .964$, and a slightly significant Test Moment × Subtitles interaction, $F(2, 21) = 3.19$, $p = .062$, $\eta_p^2 = .233$, with a significant difference between pre- and post-test, $F(1, 22) = 6.50$, $p = .018$, $\eta_p^2 = .228$, reflecting the fact that participants receiving Dutch subtitles scored better on the pre-test than participants receiving Indonesian subtitles, while the opposite was true for the post-test. A second 2 × 2 (Test Moment [between learning, post-test] × Subtitles [Dutch, Indonesian]) repeated measures ANOVA, leaving out the scores on the pre-test, revealed a trend for Indonesian subtitles to give better results overall than Dutch subtitles ($p < .14$) after L2 learning, as can be seen in Figure 3 and Table 2.

Discussion

The question we meant to answer with the present research was whether L2 subtitling can help a person to acquire a new language. The results supported the hypothesis that subtitling helps to acquire a new language by watching pictures and listening to their description in L2. More precisely, the goal was to find out whether the *language* of subtitles made a significant difference when learning a completely new language using subtitles. We expected subtitles in L2 to be more effective than subtitles in L1 when combined with spoken words in L2 and semantic information when L2 is learned intentionally. The results showed a trend that supports this hypothesis.

Both experimental groups benefitted from the learning method we used: Every single person who participated in the experiment could translate more words after one learning phase than would be expected at chance level, and even learned more words after a second learning phase. Even though we did not run the experiment on a control group (without subtitles), we can still say this method, using pictures, spoken words and subtitles, works as a way to learn words in a foreign language.

An interesting and notable effect on learning was that of word role. It appears that patients are significantly better remembered than agents, an effect we did not expect to find. Because the agent was always mentioned at the start of a sentence and the patient was always last, the first thing that came to mind was that it might be a form of the recency effect, which is especially expected for auditory presentations of words (Murdock, 1967). However, the sentences we used in the learning phase existed of only three words, so there should also be a primacy effect (which occurs with visual presentation of words; also see Murdock, 1967) and participants had to recall the items after a large number of learning trials, possibly diminishing the recency effect. Therefore, we expect the recency effect to be an unlikely explanation for the observed effects. An alternative explanation might be that the actors

interfered with each other: To make the sentences, and especially the pictures, easy to interpret, all actors were human or animal, while most patients were inanimate objects, the latter being a much broader category with many more subcategories. It may be possible that the actors, especially the human actors, were more often mistaken for each other, causing participants to make more mistakes in recalling actors compared to recalling patients.

We saw that participants in the Indonesian subtitles group had the tendency to score better on both the recall task and the picture-word matching task than participants in the Dutch subtitles group. These results are promising, not only because this trend was found with both tests we used to assess the amount of words learned by the participants, but also because our experiment was set up as a pilot experiment and was therefore run with only a small number of participants. If a trend can already be seen with only 12 participants in each experimental group, a significant effect might be found when these groups are expanded. It is also consistent with the results found by Holobow et al. (1984) and Mitterer and McQueen (2009). It might also be interesting to expand the experiment, by adding a control group that learns in the same way as our experimental groups, but without the help of subtitles. This way, the effects of using subtitles for intentional language learning by L2 novices can be fully assessed.

Although more research is necessary to find significant results for the effects we found here, our findings show much promise for the development of new language learning methods using same-language subtitling for novice language learners. They also show that, while dubbed television does not stimulate second language learning, watching television with sound-tracks in a second language does.

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Footnotes

[1] Muzzy is a BBC trademark. See www.early-advantage.co.uk for more information. Scientific proof of the method's effectiveness could not be found.

[2] Students at Dutch universities are expected to master the English language well enough to follow entire courses in English and to use it to communicate in both speech and writing at an academic level.

[3] First year Psychology students at the Radboud University Nijmegen have to participate in a certain number of experiments to pass their first year.

[4] Version 0.47, http://www.inkscape.org. Inkscape is an open source Scalable Vector Graphics editor.

Table 1a

Results of first recall task (between-learning test)

Word role	Frequency of presentation	Number of words	Average score		
			Dutch	Indonesian	Total
Agent	High	10	3.50	3.92	3.71
	Low	10	3.17	4.83	4.00
Patient	High	10	6.25	6.00	6.13
	Low	10	4.33	4.00	4.17
Verb		8	0.83	2.75	1.79
Overall		48	18.08	21.50	19.79

Table 1b

Results of second recall task (post-test)

Word role	Frequency of presentation	Number of words	Average score		
			Dutch	Indonesian	Total
Agent	High	10	6.42	7.33	6.88
	Low	10	6.58	7.25	6.92
Patient	High	10	7.25	8.25	7.75
	Low	10	5.92	6.92	6.42
Verb		8	2.33	4.50	3.42
Overall		48	28.50	34.25	31.38

Note. The average scores are the average numbers of correct answers in the 48-item recall test. The items were split into four groups of 10 items: High frequency agents, low frequency agents, high frequency patients, and low frequency patients. High frequency items were presented eight times during one learning phase, low frequency items were presented four times. The analyses of frequency and role effects were conducted using these results.

Table 2

Results of picture-sound matching task

	Average score		
	Test 2.0	Test 2.1	Test 2.2
Subtitling condition			
Dutch	19.83	33.58	36.00
Indonesian	18.17	34.67	38.00
Total	19.00	34.13	37.25

Note. The average scores are the average numbers of correct answers in the 40-item picture-sound matching task. Answers were given with a 50 percent guessing chance (yes/no), yielding an expected average score of 20 on test 2.0 (pre-test).

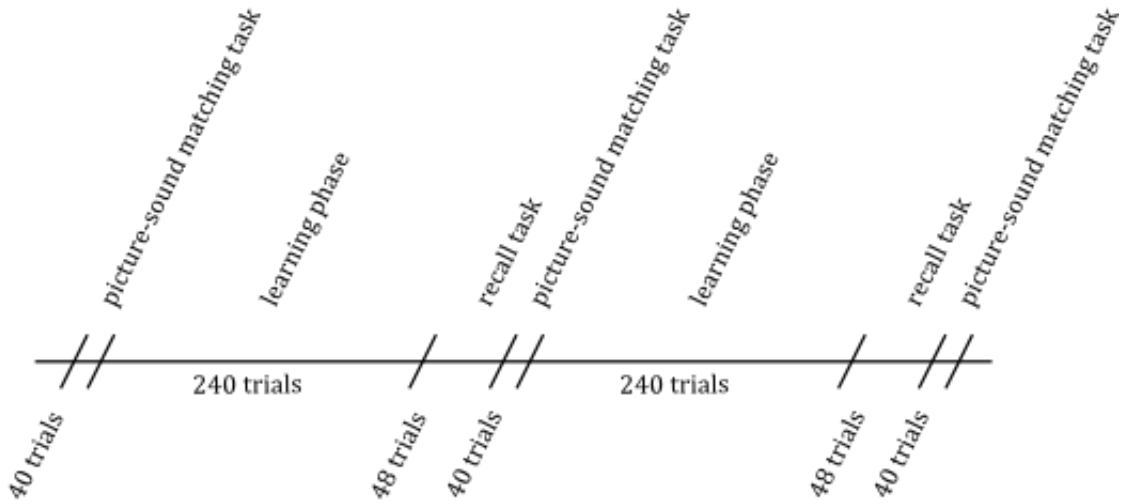

Figure 1: Timeline of the experiment. Two learning phases were administered, with a pre-test, two different between-learning tests, and two different post-tests.

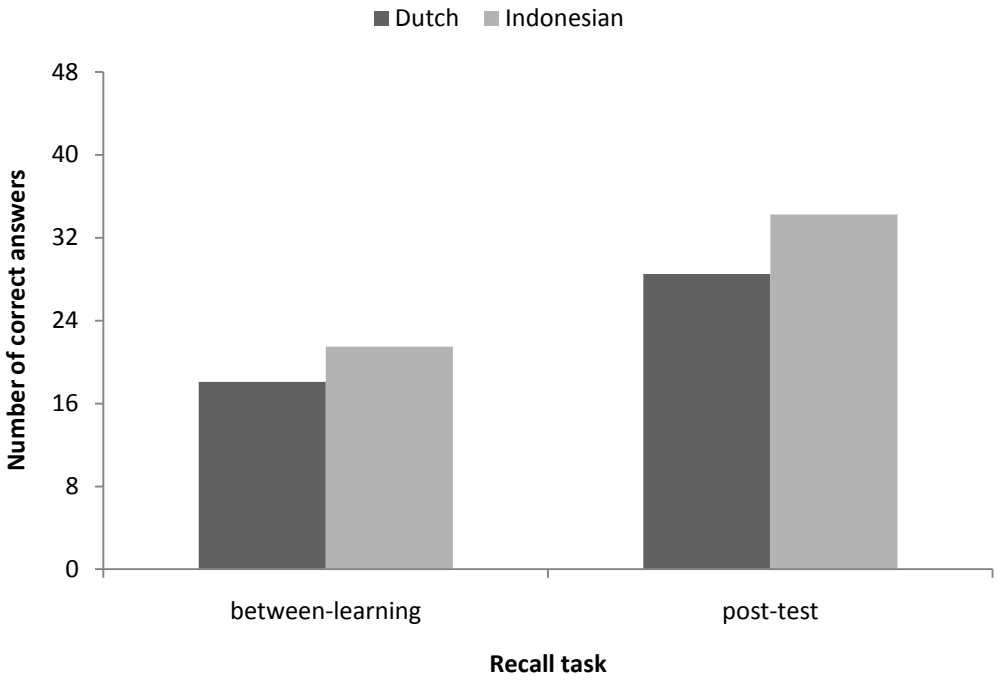

Figure 2: Average test scores on the recall task for both the Dutch and Indonesian subtitles group. Scores were determined by the number of correct answers given in the test, with a maximum score of 48.

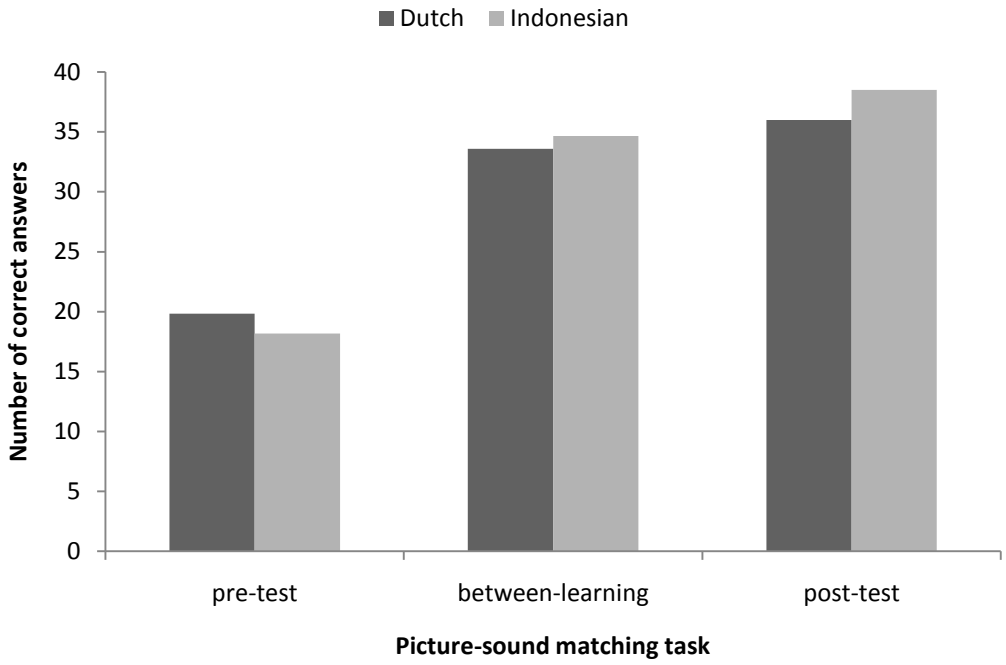

Figure 3: Test scores on the picture-sound matching task for both experimental groups. Expected average score on test 2.0 is 20, given the 50% guessing chance on 40 items.

Figure 4: The mean number of correct answers for patients and agents in the between-learning and post-test phases of the recall task.

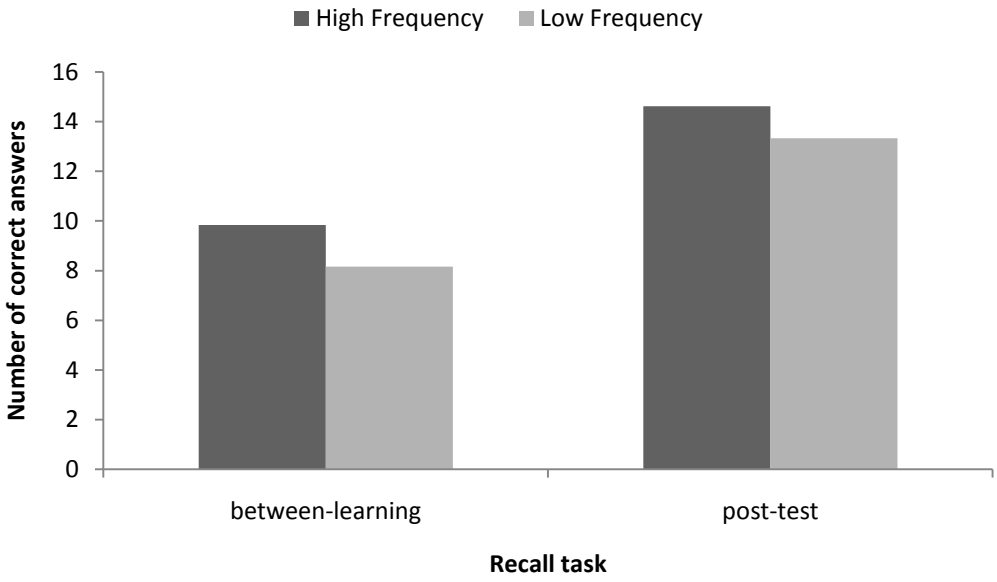

Figure 5: The mean number of correct answers for words that were presented more frequently (high frequency) and less frequently (low frequency) for both between-learning and post-test phases of the recall task

Appendix

Single-word stimuli used in the experiment

Agents

Frequency of presentation	Indonesian	Dutch	English
High	Naga	Draak	Dragon
	Malaikat	Engel	Angel
	Pemburu	Jager	Hunter
	Kucing	Kat	Cat
	Tikus	Muis	Mouse
	Ksatria	Ridder	Knight
	Kurcaci	Kabouter	Leprechaun
	Monyet	Aap	Monkey
	Tupai	Eekhoorn	Squirrel
	Unta	Kameel	Camel
Low	Badut	Clown	Clown
	Jerapah	Giraffe	Giraffe
	Rusa	Hert	Deer
	Anjing	Hond	Dog
	Penyu	Schildpad	Land turtle
	Sapi	Koe	Cow
	Gajah	Olifant	Elephant
	Serdadu	Soldaat	Soldier
	Harimau	Tijger	Tiger
	Landak	Egel	Hedgehog

Patients

Frequency of presentation	Indonesian	Dutch	English
High	Bunga	Bloem	Flower
	Kue	Cake	Cake
	Jamur	Paddenstoel	Mushroom
	Sepatu	Schoen	Shoe
	Bawang	Ui	Onion
	Tabuhan	Wesp	Wasp
	Dingklik	Kruk	Stool
	Lemari	Kast	Closet
	Lilin	Kaars	Candle
	Kursi	Stoel	Chair
Low	Pohon	Boom	Tree
	Hadiah	Cadeau	Present
	Topi	Hoed	Hat
	Payung	Paraplu	Umbrella
	Gayung	Schep	Shovel
	Cerutu	Sigaar	Cigar
	Garpu	Vork	Fork
	Burung	Vogel	Bird
	Kodok	Kikker	Frog
	Rumah	Huis	House

Verbs

Indonesian	Dutch	English
Melihat	Kijken	Look
Makan	Eten	Eat
Mengambil	Pakken	Grab
Menendang	Schoppen	Kick
Melempar	Gooien	Throw
Menunjuk	Wijzen	Point
Memukul	Slaan	Hit
Menjilat	Likken	Lick