Learning minimally different words in a third language: L2 proficiency as a crucial predictor of accuracy in an L3 word learning task

Ellen Simon[1], Paola Escudero[2], Mirjam Broersma[3]

[1]Ghent University, [2]University of Amsterdam, [3]Max Planck Institute for Psycholinguistics, Nijmegen

`Ellen.Simon@UGent.be`, `escudero@uva.nl`, `mirjam@mirjambroersma.nl`

ABSTRACT

This study examines the effect of proficiency in the L2 (English) and L3 (Dutch) on word learning in the L3. Learners were 92 L1 Spanish speakers with differing proficiencies in L2 and L3, and 20 native speakers of Dutch. The learners were divided into basic and advanced English and Dutch proficiency groups according to their scores on general listening comprehension language tests. Participants were trained and subsequently tested on the mapping between pseudo-words and pictures of non-objects. The analysis revealed that, surprisingly, English proficiency but not Dutch proficiency affected word learning in Dutch. We argue that the expansion of the vowel inventory during L2 learning facilitates L3 word learning.

Keywords: third language acquisition, word learning, minimal pairs, proficiency.

1. INTRODUCTION

The present study sets out to examine native and non-native listeners' learning of minimally different words in a third language (L3), which is defined here as the language acquired after the first (L1) and second language (L2), but which may also be the fourth or fifth language (see Hammarberg 2001:22). Specifically, this study aims to get insight into the effect of L2 and L3 proficiency on L3 word learning.

The perception and identification of L2 sounds which are not contrastive in learners' L1 is known to be highly problematic and has received ample attention in previous research (see the collection of studies in Strange 1995 and Bohn and Munro 2007 for an overview). Well known examples are the problematic perception of the English /r/-/l/ contrast by native speakers of Chinese and Japanese (e.g. Aoyama et al. 2004, Goto 1971) and that of the English /ɛ/-/æ/ contrast by native speakers of Dutch (e.g. Broersma 2005a, Escudero and Simon 2008, Schouten 1975). Inaccurate perception also entails inaccurate recognition of minimally different words. Japanese learners of English have, for instance, been shown to confuse minimal word pairs like *light-write* (Cutler and Otake 2004) and native speakers of Dutch have been reported to experience difficulty with minimal pairs like *flesh-flash* (Broersma 2005b).

Besides the difficulty that learners experience with the perception and recognition of sound contrasts in the L2 which are absent in the L1, it has also been shown that bilinguals cannot separate the lexicons of their two languages (Escudero, to appear). This holds even for highly proficient sequential bilinguals. This has implications for L2 word recognition, since it means that L2 learners listening to the L2 also activate words from their L1 (Marian et al. 2003, Schulpen et al. 2003, Weber and Cutler 2004). In L3 word recognition, the situation is even more complex, since there is cross-linguistic interaction between three instead of two languages. Dijkstra and Van Hell (2003) report on a word recognition experiment with trilingual Dutch-English-French speakers, who were asked to associate L1 Dutch words which did or did not have cognate status with L2 English or L3 French words. The results revealed that the participants were faster in associating L1 words that were cognates with their L2 English and L3 German translations, suggesting that L3 can have a cross-linguistic influence on listeners' L1, even when learners are not aware that their L3 plays a role in the task at hand. However, it is as yet unclear what the role of the two previously-learned languages, i.e. L1 and L2, is in L3 word recognition.

A number of previous studies have investigated the effect of L2 proficiency on L2 acquisition, but provide contradictory evidence: while some studies have shown that experience in the L2 positively

correlates with L2 perception and production (Flege 1991, Flege et al. 1997), others did not find a facilitative effect of L2 experience (Cebrian, 2003, 2006; Escudero et al. 2009). The situation is again more complex in L3 acquisition, as both proficiency and experience in the L2 and L3 have to be taken into account.

The present study aims to get insight into the role of learners' L2 and L3 proficiencies in the acquisition of novel L3 words. To that end, we conducted a word learning task in which L1 Spanish speakers with differing proficiencies in L2 English and L3 Dutch performed a Dutch word learning task with novel words.

2. METHOD

2.1. Participants

In total, 92 native speakers of Spanish and a control group of 20 native speakers of Dutch participated in the study. The Spanish-speaking participants came from Spain or a variety of Latin American countries and resided in the Netherlands at the time of testing. All participants performed a general listening comprehension test in Dutch and English prior to testing (DIALANG, www.dialang.org, Alderson and Huhta, 2005). On the basis of the scores for this test, participants were divided into five groups according to their listening proficiency in English and Dutch. Table 1 presents the five groups and the number of participants in each group.

Table 1: Average and sd (between brackets) for each of the five proficiency groups of: N= number of participants, AT= age at testing, AoA=age of arrival, LoR= length of residence. (D = Dutch, E = English).

| Group	Language proficiency	N	AT	AoA	LoR
1	D native speakers	20	21.00 (2.6)	--	--
2	Basic D, Basic E	19	33.32 (7.6)	30.84 (7.1)	2.49 (2.7)
3	Basic D, Advanced E	10	30.60 (3.6)	29.30 (3.6)	1.49 (1.1)
4	Advanced D, Basic E	40	39.02 (8)	31.90 (7.3)	7.04 (5.7)
5	Advanced D, Bdvanced E	23	34.04 (8)	28.39 (7)	5.90 (4.1)

2.2. Stimuli

The stimuli consisted of 12 Dutch pseudo-words, six of which were minimally different from each other and six of which were completely different.

The minimally different items were of the form /pVx/, with one of six Dutch vowels, yielding the words /pɪx/, /pix/, /pʏx/, /pyx/, /pɑx/, /pax/.

The other items were disyllabic pseudo-words taken or adapted from Shatzman and McQueen (2006), namely /ˈbeːptu/, /ˈfoːmpəl/, /ˈjɔmtoː/, /ˈkɛstə/, /ˈsurkɛt/, /ˈtœykfɔm/.

Each of the twelve pseudo-words was paired to a line drawing of a pseudo-object (Shatzman and McQueen 2006) (see Figure 1 for examples).

Figure 1. Two examples of pseudo-objects (Shatzman & McQueen 2006)
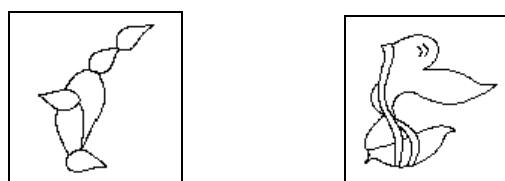
2.3. Design

The experiment consisted of two parts: a training phase and a testing phase.

During the training phase, participants were first presented with a visual stimulus together with an auditory stimulus ('This is an X'). Next, they were presented with the same visual target stimulus together with a visual distracter stimulus, and they were asked to click on the target stimulus ('Click on the X'). The total number of trials in the training phase was 72 (12 items * 6 trials as target).

During the test phase, two visual stimuli were presented and participants were asked to click on the drawing which matched the auditory stimulus ('Click on the X'). Items were presented either together with a drawing of a minimally different item ('Minimal pair condition', e.g. a picture of a /pɪx/ presented with one of a /pix/, with the instruction 'Click on the /pɪx/), or with a drawing of a completely different item ('Non-minimal pair condition', e.g. a picture of a /pɪx/ presented together with one of a /ˈbe:ptu/, with the instruction 'Click on the /ˈbe:ptu/).

2.4. Procedure

Participants were tested one at a time in a quiet room. For the training phase, they were told that they were going to be taught new Dutch words. For the testing phase, they were informed that they were going to be tested on their recognition of the newly learnt Dutch words. Each phase started with a number of practice trials, after which participants could ask questions. There was a short break between training and test phase, in which instructions were provided.

3. RESULTS

The average percentage correct for each participant was higher than 70% (range: 70%-100%) and all results were therefore included in the statistical analyses.

Repeated measures ANOVAs were done on the Spanish listeners' results with Pair Type (minimal pair and non-minimal pair) as within-subjects variable and Dutch and English proficiency (advanced and basic) as between-subjects variable. In the first ANOVA, the dependent variable was the percentage of correct responses, in the second one it was the RT. The analyses revealed that minimal pairs had a lower percentage correct than non-minimal pairs (percentage correct: $F(1,88)=177.53$, $p<0.001$; RT: $F(1,88)=172.23$, $p<0.001$). Surprisingly, learners with advanced Dutch proficiency did not have a higher percentage correct than those with basic Dutch proficiency ($F(1,88)=0.011$, $p=.918$). However, learners with advanced English proficiency had a higher percentage correct than those with basic English proficiency ($F(1, 88)=10.297$, $p<0.01$).

Regarding percentage correct, there was a significant three-way interaction between Pair Type, Dutch Proficiency, and English Proficiency ($F(1,88)=5.40$, $p<0.05$). In order to investigate this three-way interaction, the advanced and basic English proficiency groups were compared with two t-tests, for minimal pairs and non-minimal pairs separately. Learners with advanced Dutch proficiency did not have a significantly higher percentage correct than learners with basic Dutch proficiency, neither for the minimal pairs ($t(91)=1.35$, $p=0.249$) nor for the non-minimal pairs ($t(91)<1$). Crucially, however, learners with advanced English proficiency did have a higher percentage correct than learners with basic English proficiency, both for the minimal pairs ($t(91)=6.58$, $p<0.05$) and for the non-minimal pairs ($t(91)=4.73$, $p<0.05$).

In order to further explore the three-way interaction for percentage correct, each of the four groups of Spanish learners (with advanced-advanced, advanced-basic, basic-advanced, and basic-basic proficiency in Dutch and English, respectively) and the Dutch native listeners were compared. First, a repeated measures ANOVA on percentage correct with Pair Type as within-subjects factor and Group (see Table 1 for the 5 groups) as between-subjects factor showed a significant interaction between Pair Type and Group ($F(4,107)=7.41$, $p<0.001$). Separate one-way ANOVAs for minimal and non-minimal pairs showed a significant effect of Group for the minimal pairs ($F(4,111)=9.74$, $p<0.001$) but not for the non-minimal pairs

($F(4,111)=2.12$, $p=0.083$). Therefore, further investigations were done with the minimal pairs only. Table 2 presents the results of Bonferroni-corrected comparisons between the five groups.

Table 2: Bonferroni-corrected post-hoc tests comparing the five listener groups, for mean difference in percentage correct for minimal pairs. (Positive and negative values refer to the group on the top row, having a higher or lower percentage correct, respectively, than the group in the left column). (D = Dutch, E = English).

	D native speakers	Advanced D, Advanced E	Advanced D, Basic E	Basic D, Advanced E	Basic D, Basic E
D native speakers	-				
Advanced D, Advanced E	+7, $p<0.05$	-			
Advanced D, Basic E	+8.9, $p<0.01$	+1.8, $p=1.0$	-		
Basic D, Advanced E	+3.8, $p=1$	-3.2, $p=1.0$	-5.1, $p=0.519$	-	
Basic D, Basic E	+13.7, $p<0.01$	+6.7, $p<0.05$	+4.9, $p=0.185$	+9.9, $p<0.01$	-

The results in Table 2 show that the Dutch native listeners' percentage correct for the minimal pairs was significantly higher than that of all other groups, except for the learners with basic Dutch and advanced English proficiency, whose accuracy did not significantly differ from the native listeners' percentage correct (possibly due to low statistical power, as that learner group contained only 10 subjects; see Table 1). As for the learner groups, Bonferroni-corrected comparisons suggest again that English proficiency was a more important predictor of accuracy on the task than Dutch proficiency: groups that differed only in Dutch proficiency (i.e., *advanced Dutch* and advanced English versus *basic Dutch* and advanced English, and *advanced Dutch* and basic English versus *basic Dutch* and basic English) did not exhibit a significant difference in accuracy. By contrast, some groups that differed only in English proficiency had significantly different accuracies: learners with basic Dutch and *advanced English* proficiency had a higher percentage correct than learners with basic Dutch and *basic English* proficiency. These results confirm that the source of the difference in percentage correct lies in the learners' level of English proficiency rather than in their Dutch proficiency.

4. DISCUSSION AND CONCLUSIONS

The most important finding in the present study is that proficiency in the learners' L2, English, was a better predictor of their accuracy in learning minimally different Dutch words than their proficiency in their L3, Dutch. Here we address a number of possible explanations for this surprising result.

One potential explanation why learners with advanced English proficiency performed better at the Dutch word learning task than learners with advanced Dutch proficiency could lie in learners' different levels of proficiency in English (L2) and Dutch (L3). Specifically, if learners' average level of English proficiency were higher than their average level of Dutch proficiency, this would explain why proficiency in English had more influence than proficiency in Dutch. We tested this hypothesis with an independent samples t-test comparing the Dialang scores (from 1 to 6) of the learners who had high English proficiency with those who had high Dutch proficiency. Crucially, we found a significant difference in the opposite direction, i.e. proficiency in

Dutch was higher than proficiency in English (Dutch advanced mean (N=63): 5.62, English advanced mean (N=33): 4.67, $t(94)$=6.953, p<0.001). In other words, the advanced Dutch and English learners were not more proficient in English than in Dutch.

A second explanation related to the learners' level of proficiency in the two languages could be a difference in the ranges of proficiency scores: the difference between English advanced and basic might be larger than that between Dutch advanced and basic. However, an independent samples t-test comparing the Dialang scores that were grouped as basic Dutch proficiency with the scores that were grouped as basic English proficiency again reveals a result in the opposite direction: the basic Dutch scores were on average lower than the basic English scores (Dutch basic mean: (N=29): 1.448, English basic mean (N=59): 2.017, $t(66.84$[1]$)$=-3.159, p<0.01). Further, as shown above, the advanced Dutch scores were on average higher than the advanced English scores. Thus, learners with advanced Dutch had higher Dialang scores than learners with advanced English, while learners with basic Dutch had lower scores than learners with basic English. Consequently, the difference between advanced and basic learners was larger in Dutch than in English, which contradicts the hypothesis that a higher English proficiency could account for the fact this language was the best predictor of L3 word learning accuracy.

Thirdly, general second language acquisition constraints such as the age factor, the order of acquisition and foreign language learning abilities (see, among others, Mayo and Lecumberri 2003, Singleton and Ryan, 2004) are likely to have contributed to the present results. Specifically, the fact that the learners in this study had acquired English earlier in life than Dutch could potentially account for the greater influence of English proficiency compared to Dutch proficiency. Whereas the Dialang scores showed that the learners were not more proficient in their earliest acquired foreign language, English, than in their L3, Dutch (general listening proficiency in Dutch was higher than in English), it could still be the case that an earlier acquired language affects L3 learning more than a later acquired language.

Finally, the most likely explanation for the greater influence of English proficiency compared to Dutch proficiency is that English is comparable to Dutch in terms of the size of the vowel inventory. Specifically, the English vowel inventory is considerably larger than the Spanish one and hence more similar in size to the Dutch inventory. The expansion of the vowel inventory during the acquisition of English may have benefited word learning in Dutch. Even though Dutch and English vowels are not the same, this similarity in vowel inventory size between English and Dutch may be the key to the facilitative effect of English on the learning of Dutch words: learners who have acquired a second language with a large vowel inventory would have an advantage when learning a third language with a similarly large inventory. Similarly, Mattock et al. (2010) showed that bilingual French-English infants learned minimally different words faster than monolingual children when the words differed in phoneme contrasts that were contained in both of the bilingual infants' two languages. Possibly, the support of an L2 with a similar sound system is required for language proficiency to have an effect on vowel perception and word recognition, which might explain why in our study Dutch proficiency on its own could not predict learning accuracy. The hypothesis that vowel inventory expansion affects L3 learning also implies that L2 learners of a language with a small vowel inventory would not have the same advantage when learning an L3 with a large inventory. For instance, Spanish learners of Dutch would not have an advantage when learning Dutch words had they learned Basque or any other language with a small vowel inventory as a second language, instead of English. This was confirmed by Gonzalez Ardeo (2001) and Gallardo del Puerto (2007), who showed that Spanish-Basque bilinguals did not show an advantage over monolinguals when learning English vowels. If knowledge of a language with a small vowel inventory does not facilitate the learning process, the general conclusion can be that L2 language learning by itself does not necessarily or automatically facilitate L3 learning.

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